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The Welding Engineer

SEPTEMBER, 1944

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VOL. XXIX, NO. 9 SEPTEMBER, 1944

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Published on the 1st of each month by The Welding Engineer Publishing Co., 506 So. Wabash Ave., Chicago 5. Phone Webster 7134.

Copyright, 1944, by The Welding Engineer Publishing Co.

Subscription, United States, possessions, and Canada, $3 a year; foreign countries, $4 a year; single copy, 35 cents. Entered as second-class matter January 20, 1916, at the postoffice at Chicago, Illinois, under the act of March 3, 1879.

FOREIGN REPRESENTATIVES: AUSTRALIA and NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand; BRAZIL—Alpha Jewel, Caixa Postal No. 2411, Rio de Janeiro, Brazil; GREAT BRITAIN—A. D. Baynes, 1 Cambridge Park Court, Twickenham, Middlesex, England; SOUTH AFRICA—J. W. Arnison, 35a Victoria Avenue, Benoni, Transvaal, South Africa; U. S. S. R.—Mesdunarodnaja Kniga-Kusnezki Most 18, Moscow, U. S. S. R.

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WRITE FOR BULLETIN NO. 1943-G.

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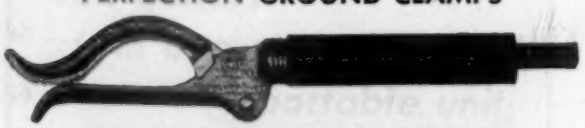

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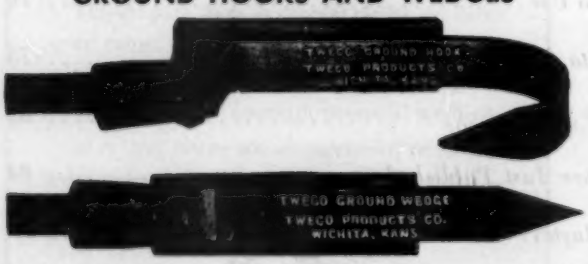

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DISTRIBUTORS ALL OVER THE UNITED STATES

The Welding Engineer

AMERICA'S PIONEER WELDING JOURNAL

Established 1916

Salvos for Salvage!

War, the most wasteful of endeavors, is being won by the salvage of waste.

Necessity has turned proverbially prodigal America into a nation of string and sack savers. Persons who have never before saved a thing in their lives are saving not only string, sacks, toothpaste tubes, waste paper and countless other heretofore useless items but are also saving money—through the purchase of war bonds that will not be cashed until well after the duration.

Saving—despite the fact that so few Government officials seem to believe in it—is a most desirable habit for both nations and individuals. The same may be said for salvage.

Salvage is second nature for those of us in the welding industry. Ever since it came into use, welding has been used as a means of salvaging metal parts.

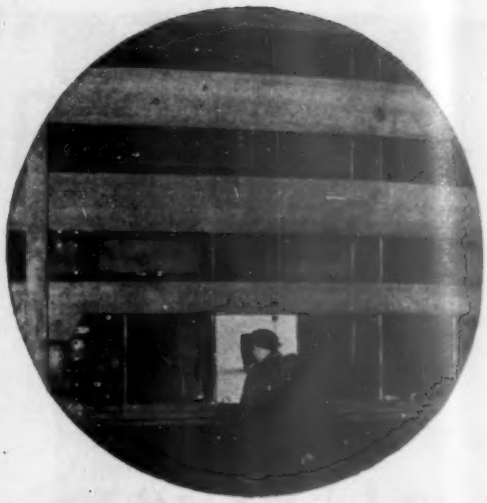
It was welding which salvaged sabotaged German ships of the last war, ships which their German crews believed had been permanently wrecked. The Teutonic dolts in their blind stupidity were utterly unaware of what American ingenuity could do with welding. The result was that damage which should have taken years to undo was repaired in less than a year. The supposedly useless ships became troop ships, and a war was won.

Needless to say, welding did not rest on these 1917-18 laurels. Every year it has become an increasingly important process in the salvage and reconditioning of equipment. During the past three years reconditioning and salvage activities have carried welding to all of the fighting fronts in this widespread global war.

Arc welders and gas torches are among the first pieces of equipment to be landed by "Fighting Engineers" and "Seabees" on a new invasion beachhead. Welding and cutting equipment must be at hand so that damaged tanks and trucks and guns and bridges may be made serviceable for fighters with the minimum of delay.

Though less spectacular, the home front uses of welding are equally as important. A tractor, a plow or a thresher breaks down, and the farmer's first thought is to weld it. "Weld" is also the plant engineer's first remark as he views a broken machine in a war plant.

Yes, salvage is second nature for those of us familiar with welding. Let's make others salvage conscious, too. . . not only as the word is applied to welding but as it concerns waste paper, scrap iron, kitchen fats and all the other waste materials that are needed to finish Hitler and his Jap ally.



CHEROKEE DAM GATE is one of three identical 135,000 pound giants that were 95% welded by Murex electrodes for the T.V.A. Welds were ¾" and all were peened to relieve undue stresses set up by heating, with some sections pre-heated to prevent warping. Gate members were clamped together on a large surface plate during welding operations.

LOADING MACHINERY, used in coal mining, manufactured by the Jeffrey Manufacturing Company, is subjected to severe vibrations and stresses. Frames are all welded from specially shaped plates, bars or tubes. Murex electrodes are used, most welds being fillet welds—either single or multipass, continuous or intermittent.

PROVING GROUND for testing Murex electrodes comes to the production line of the M & T plant. Groups of electrodes are taken at random and thoroughly tested by welders for rod performance, soundness of weld metal, arc and slag action, and other characteristics. Just another reason for the superiority of Murex electrodes and their assured uniformity.

RIPPERS, special heavy-duty construction implements manufactured in quantity by the Southwest Welding & Manufacturing Company for the armed forces, require approximately 325 feet of welding per unit, principally automatic. Each unit consists of three main assemblies—main frame, wheel frame and wheels. Murex Type F electrodes are specified for the welding because of their excellent physical properties, good penetration, high ductility and soundness of weld metal, which must withstand the severe daily stresses which are imposed upon this equipment.

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★ DESIGN

Design for Arc Welding

"My problem is different!" Yes, but is it really different? Or are the principles of good design the same for everything from simple equipment up to machines as large and as complicated as a 500 ton hydraulic press?

By **T. B. JEFFERSON**

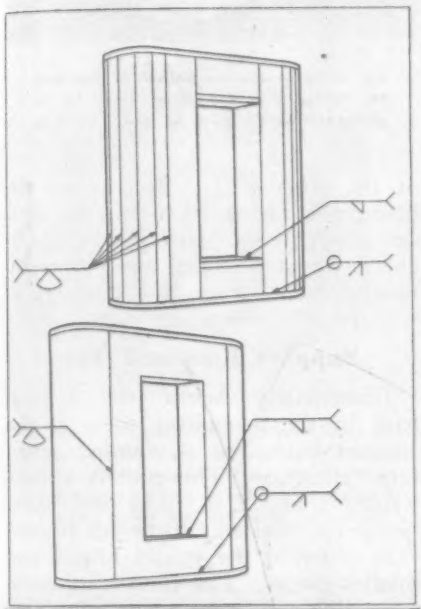


Fig. 1—Design sheet for hydraulic press side frame. Top: design for fabrication without bending press. Bottom: design employing bending press to avoid corners.

"QUICKEST delivery of 500 ton hydraulic press of any model two years." This quotation is from a telegram received at a midwestern plant vitally in need of a 500 ton hydraulic press for use in connection with its expanded war contracts.

Since lives depended upon this plant's production, it was altogether out of the question to wait two years for purchased equipment. Yet two years was the minimum period for delivery. The demand for hydraulic presses has become tremendous, for they are needed to form metal parts for all types of military equipment—aircraft parts, powder metallurgy applications in machine tool production, plastic moldings, welding electrode extrusion, straightening forgings, straightening armor and for many other applications equally as important.

Building Its Own

The needed press could be built in the plant itself since there was a very complete machine shop available. It was decided to fabricate it from castings purchased on the outside. Fortunately, someone had sufficient foresight to investigate the foundry situation before ordering patterns. Foundries were loaded to capacity—undoubtedly they will be for a long time to come. Consequently, any attempt to build the press from castings would mean a considerable delay.

The chief engineer sat down to do some high powered thinking. Adequate welding facilities were available, he pondered, so why not weld it? The job could not be too difficult since it would involve no more than the welding of somewhat heavier plate than was being used for standard production.

Executives not so familiar with the applications of welding might have been skeptical at the thought of fabricating a machine so complicated and demanding such precision. This plant, however, was accustomed to the use of welding and flame-cutting in the design and fabrication of general industrial equipment and had developed considerable skill and ingenuity in solving its production problems with welded design.

The Modern Trend

The combination of flame-cutting and arc welding, it should be noted, has come to be widely used in recent years. In order to meet the new demands of industrial design and manufacture initiated by war production experience, manufacturers are turning more and more to the replacement of castings by arc-welded assemblies of special flame-cut parts and standard structural members.

An important consideration when planning the introduction of a new product or the improvement of an old one is selection of the most suitable material with due regard for:

(*a*) Greatest strength with minimum weight and bulk.

(*b*) Longest useful life under required service conditions.

(*c*) Adaptability of material to the most economical production method.

(*d*) Lowest overall cost that meets the above requirements.

Good Appearance, Too

When the material has been selected on this basis, and particularly when arc welding has proved to be "the most economical production method," the designer will find that the element of attractive appearance under modern standards will take care of itself. He needs only to design from already proved design suggestions.

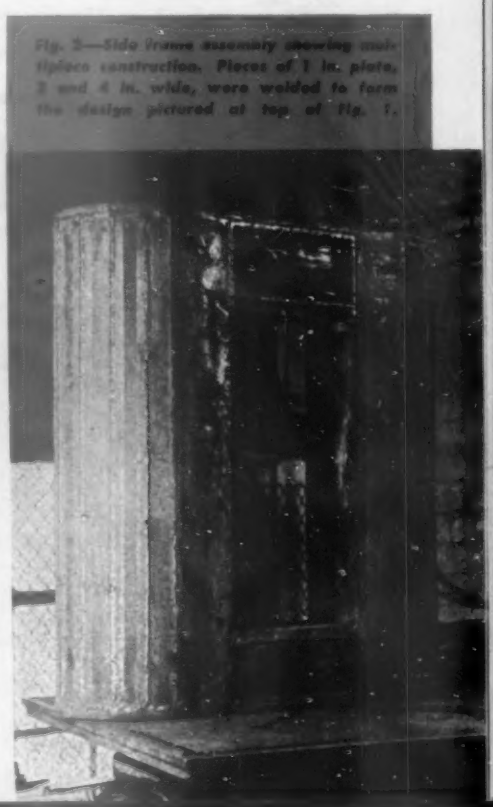


Fig. 2—Side frame assembly showing multiplate construction. Pieces of 1 in. plate, 2 and 4 in. wide, were welded to form the design pictured at top of Fig. 1.

It is surprising, too, what can be secured in the way of efficient service, economical production and modern appearance by making use of stock materials suitable for arc welding. Steel sheets, plates, bars, tubes and standard structural shapes are available in readily accessible warehouses for immediate delivery to all parts of the country. With an understanding of the possibilities of arc welding, the ingenious designer can devise almost unbelievably complicated assemblies from a combination of stock steel products. Punch press and press brakes, too, can be used to convert sheets and plates into parts of special cross-sectional form when such are required for welding into a particular assembly.

A Multipiece Design

The engineering department soon developed a basic design for the 500 ton hydraulic press. The press, which has a 32 by 36 in. working space and a 40 in. stroke, was built in five sections. Each component part was broken down on a design sheet to show possible methods of welded fabrication. Such a sheet is shown in Fig. 1. Here two possible ways of building the side frame of the press are illustrated. The upper design, which builds a rounded streamlined corner from several bars welded together, takes into account the possibility that the fabricating shop may not have sufficient bending roll or brake capacity to form the corners that are pictured in the lower design. This happened to be true; it was found that the shop did lack equipment capable of forming sections that were sufficiently heavy to provide the required strength. The multipiece design (top, Fig. 1) was therefore selected as the method of construction to be followed.

steel material either 2 or 4 in. wide. The corners were formed from 1 by 2 in. bars. These bars were beveled slightly so that little grinding would be required for finishing. After beveling, the various pieces were tack welded on the inside. The assembly was then mounted on a positioner to permit the finish welding to be done downhand. The final welding necessitated the closing of all seams from the outside.

Two side frame assemblies were required. Although used on the right and left sides, they are identical in construction.

Tension Base

Naturally, severe tension stresses would be developed in the use of this 500 ton press. These would be absorbed by the tension base, Fig. 3, a fabricated structure combining the advantages of arc welding and flame-cutting. This assembly was constructed entirely of 2 in. plate with the exception of the thick walled tubes on each corner. These served as tension rod guides. On the front and back walls, the base plates were doubled so as to provide a wall 4 in. thick. Plug welds (see Fig. 3) were used to tie the plates together. The square openings shown in the front and back walls of Fig. 3 are access holes to the pit beneath the floor for changing the size of die push-out plunger or plates on lower press.

The side walls were also double, but these plates were separated by a 6½ in. dead air space. Full strength fillet welds were used to tie the plates and tubes together into an integral structure.

When finally installed as a unit of the finished press, the base was covered with 12 gauge sheet metal, welded in place. This gave the piece the same general streamlined appearance

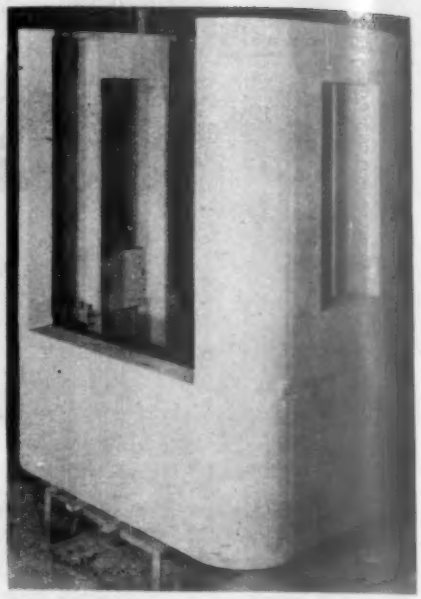


Fig. 5—Side frames bolted to top unit. The latter was fabricated from ½ in. plate and bars 1 by 2 in. and 1 by 4 in.

of the other parts. Because of the heavy fillets required to join the various plates, it was more practicable to obtain the streamlined appearance by fairing rather than by grinding, as was done on the other parts.

Support Base and Top

Immediately below the tension base in the assembled press is the support base, Fig. 4, another fabricated structure. This unit is of arc-welded 1 and 2 in. mild steel plate. Scrap material was flame-cut to provide many of the gusset braces and smaller pieces. The corner segments were obtained from a minimum size plate by careful "nesting" when the cutting was done.

The side frames shown in Fig. 2 are shown bolted to a top unit in Fig. 5. This top unit was fabricated from ½ in. plate and mild steel bars 1 by 2 and 1 by 4 in. It will be noted that the welds have been ground smooth. When paint filler and the finishing coats of paint have been applied to these surfaces, the finish will be as smooth as that of any machine tool.

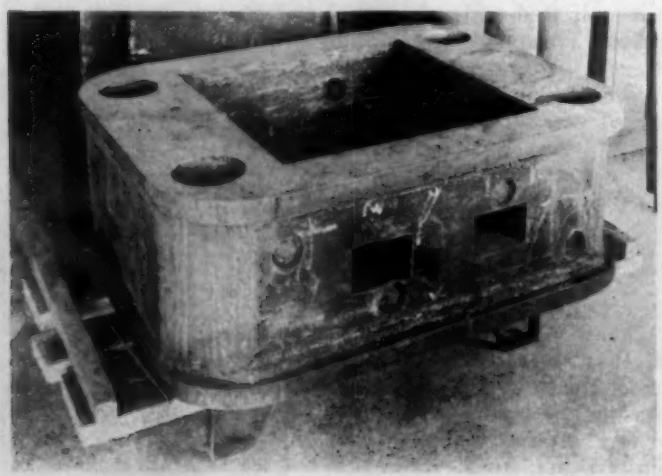


Fig. 3 (left)—The tension base. To avoid the use of 4 in. plate, the front and back walls were each formed of two plug-welded sections of 2 in. plate.

The resultant fabricated side frame is shown in Fig. 2. The side frame was fabricated wholly of 1 in. mild

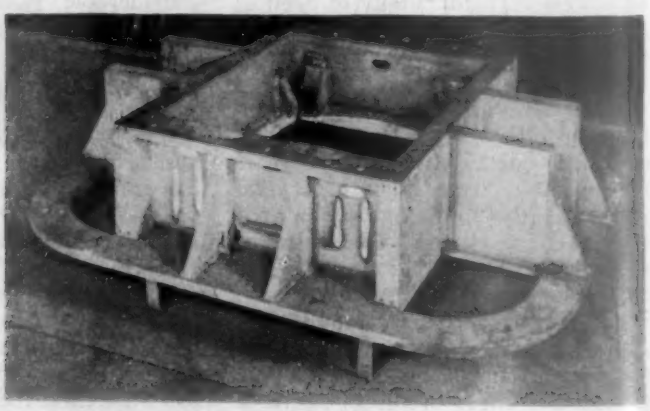


Fig. 4 (right)—The support base. This unit was fabricated by welding 1 and 2 in. plate.

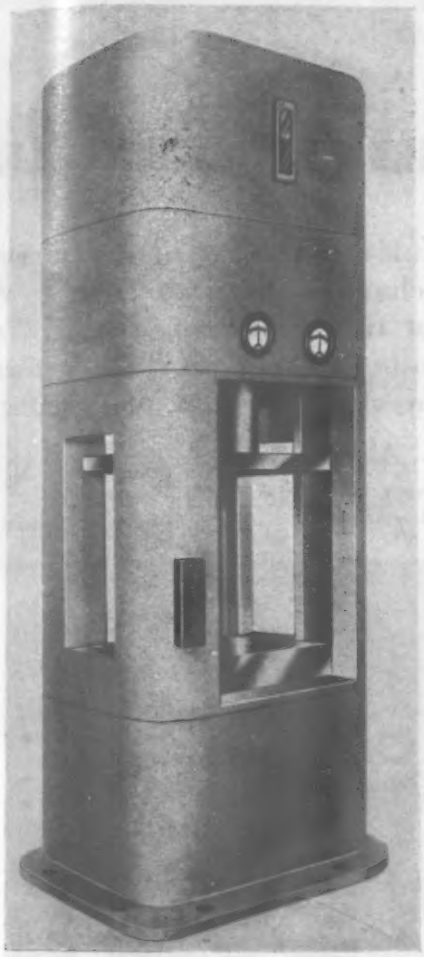


Fig. 6—Here all five sections—two side frames, tension base, support base and top—have been assembled to complete the 500 ton press, which occupies a 32 by 36 in. working space and has a 40 in. stroke.

This is borne out by the appearance of the finished press, Fig. 6.

After the various sections of the press had been fabricated by arc welding, they were assembled and fastened together by four 5½ in. tie rods, one in each corner of the assembly. Though this 500 ton hydraulic press was built in five sections in order to facilitate machining, the number of sections could have been either more or less, depending on the machine shop equipment available. By the same token, the amount of welding could have been reduced if the bending equipment available had been adequate to form the rounded corners.

From War to Peace

The design and building of this hydraulic press was a war emergency problem. Some designers may say that their problems bear no relationship to a hydraulic press. Apparently not, on the surface, but principles basic to all design problems were involved in the design and fabrication of this piece of heavy-duty equipment.

Soon we hope to be hearing the plaintive cry, "Oh, but my problem is different. We have to meet *peacetime* conditions now." But peace or war, the answer will be fundamentally the same.

To obtain the maximum economy from welded steel construction, the newly designed machine should first be made in welded steel and tested to get the "bugs" out of it. The design should then be corrected for overweight, etc. Finally, it will be necessary to take into account the possibility of later changes or special adaptations for service requirements other than those for which the machine was originally designed.

What Designers Must Consider

Good structural design involves considerably more than the provision of material adequate to withstand known or calculated stresses. Among the factors which limit the choice of design are the following:

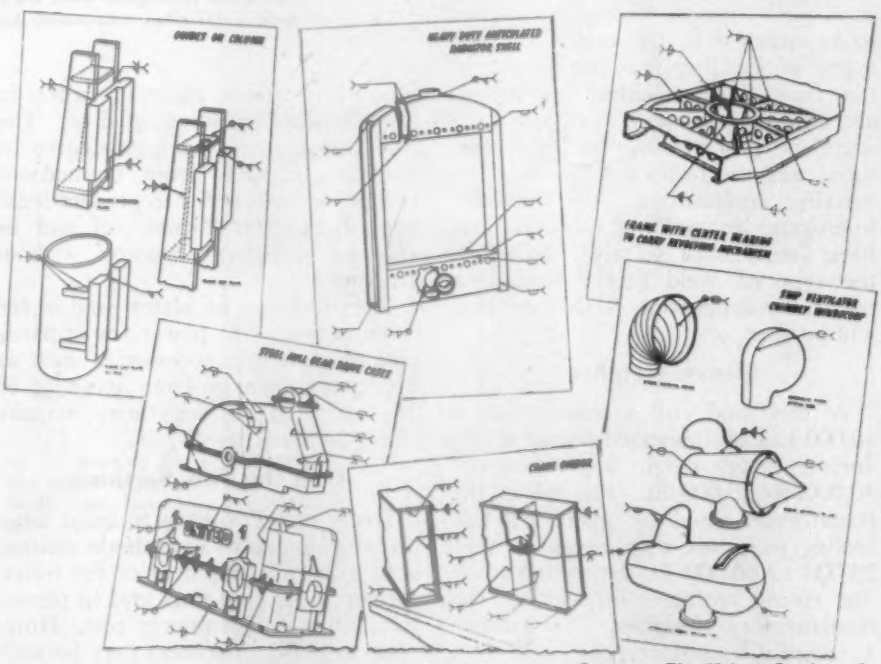
(1) Number of units to be built,
(2) Available machinery and equipment,
(3) Available materials,
(4) Personnel skilled in the trade,
(5) Permissible weight,
(6) Permissible size in view of shipping limitations,
(7) Intended service life,
(8) Attractive appearance.

The fact that in welded construction the designer usually has several possible solutions to any particular problem enables him to meet situations which might otherwise be difficult. Structural shapes, plates, slabs, pipes and tubes have been used in welded design to build structures of widely different functions. These readily available forms of steel may be incorporated with forgings, castings and press-formed components, permitting the welded design of practically anything made of metal.

Machines that were formerly made of cast iron and fabricated by means of bolts, screws, rivets, etc., are now made of steel or other weldable metals and designed specially for welded joints. Wherever practicable, older joining methods are being replaced by the welding arc. The availability of new steel alloys of exceptionally high tensile strength and special electrodes that make possible the welding of both light and heavy sections will greatly magnify the designer's opportunities in thousands of new manufacturing applications.

Other examples—both simple and involved—of the application of practical design principles are shown in Fig. 7. Such suggestions as those pictured in these diagrams may readily be incorporated in any design. Aided by such practical ideas—even though they were developed originally for entirely different lines of equipment—designers are often able to solve many of the problems with which they have been having difficulties.

Today, the modern trend toward simplicity of design, the trend commonly known as "streamlining," has had the effect of opening the minds of designers and encouraging them to use more originality and ingenuity, both in the design of new products and in the redesign of old ones.



Courtesy, The Hobart Brothers Co.

Fig. 7—These design sheets show possible methods of welded fabrication for many different products. Some of the ideas depicted may be adaptable to your own use.

★ CONSTRUCTION

Welding Transformer Tanks

A large power-transformer tank must have (1) permanent oil tightness and (2) a mechanical strength capable of supporting from six to eight times its own weight. To meet these rigid requirements, all-welded construction is being used to replace the older method of riveting.

By **H. W. ALLISON**

Power Transformer Mfg. Div., General Electric Co.

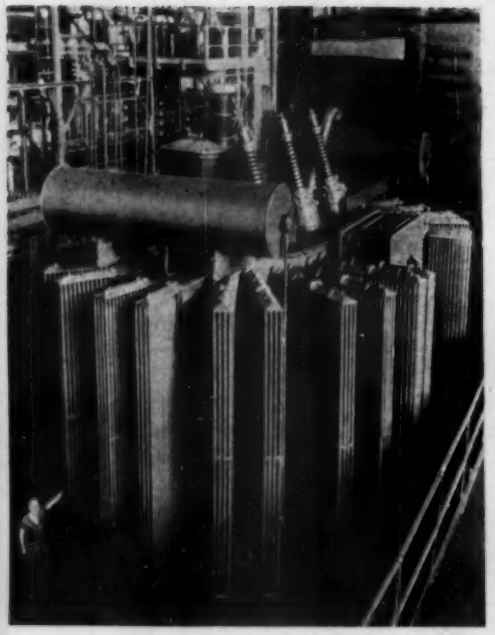


Fig. 1—This 75,000 kva giant—one of the largest power transformers ever built at General Electric—weighs 250 tons when it is filled with oil.

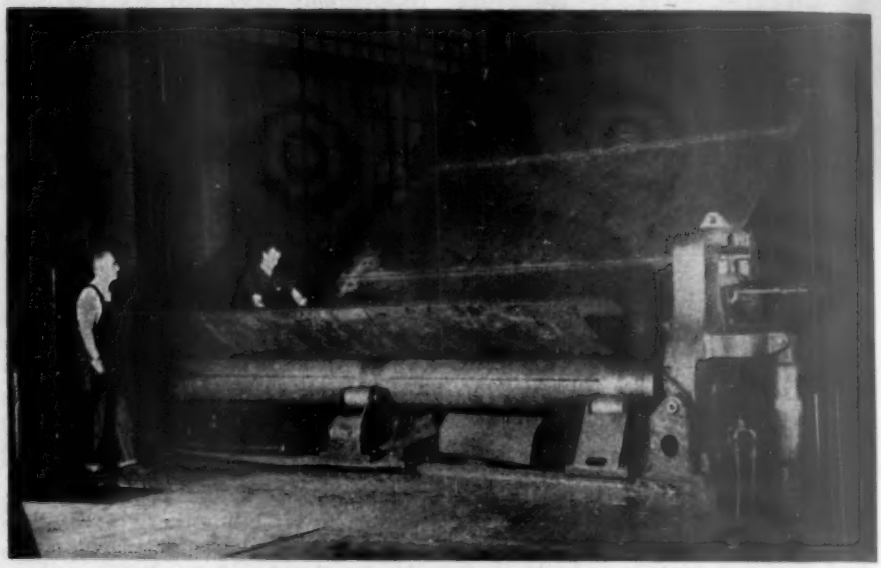


Fig. 2—Plates for round and elliptical tanks are form-rolled; those for square and rectangular tanks are bent on a hydraulic brake. Before either forming operation, tube-header holes are punched while the plate is flat.

CONTRASTED to older methods used in fabricating power-transformer tanks, many modern techniques are now employed. For instance, instead of using rivets, we weld all seams, flanges, lifting lugs, jack bosses, braces and other parts attached to the tank. Various types of welding may be found in our tank shop, including a-c metal-arc welding for heavy work and oxy-acetylene gas welding for light material and in restricted places. For certain applications, the atomic-hydrogen arc-welding process has been found most suitable. In short, the type of weld best suited to a particular application is the one that will be used.

Heavy Weights

A core and coil assembly for a 10,000 kva oil-immersed power transformer may weigh approximately 40,000 to 50,000 lb. The oil in the transformer, used for insulating and cooling purposes, may weigh another 28,000 to 60,000 lb, depending upon the circuit voltage for which the transformer is designed. Fig. 1 shows a recently manufactured 75,000-kva giant transformer that weighs more than 250 tons when filled with oil.

The transformer tanks are made from low-carbon plate in order to provide good welding quality. The plate must possess a high degree of flatness, be free from laminations and porosity in order to prevent leakage of the transformer oil and be able to withstand bending without fracture.

The thickness of plates used in the construction of power-transformer tanks (excluding accessories such as lifting lugs) varies from about ¼ to 1⅜ in. Lifting lugs may require plates as thick as 4½ in.

One or Two Sections

Every effort is made to build large transformer tanks in a single section, both to permit shipment of the transformer in its own tank and to permit installation at minimum cost. However, railroad clearances may be such that some extremely large tanks must be made in two sections and disassembled for shipment. When the transformer is installed, these sections are either bolted together with a gasket between the flanges or are welded together in the field.

In normal times, plates for these tanks were obtained from the mills in approximately the sizes required. One of the largest size plates we have used measured 169 by 318 in. Now, as a wartime necessity due to restrictions on steel plates, standard sizes—72 by 240 in. for tanks and 60 by 240 in. for bases and covers—are cut and welded to fit the specifications. The plates made from these multiple sheets have given excellent results, thanks to the rapid strides made in perfection of electrodes and welding generally.

"Bottle-tight" Welds

The edges of the plates are prepared for welding by machine gas cutting. The segments are first joined together by means of a light hand-

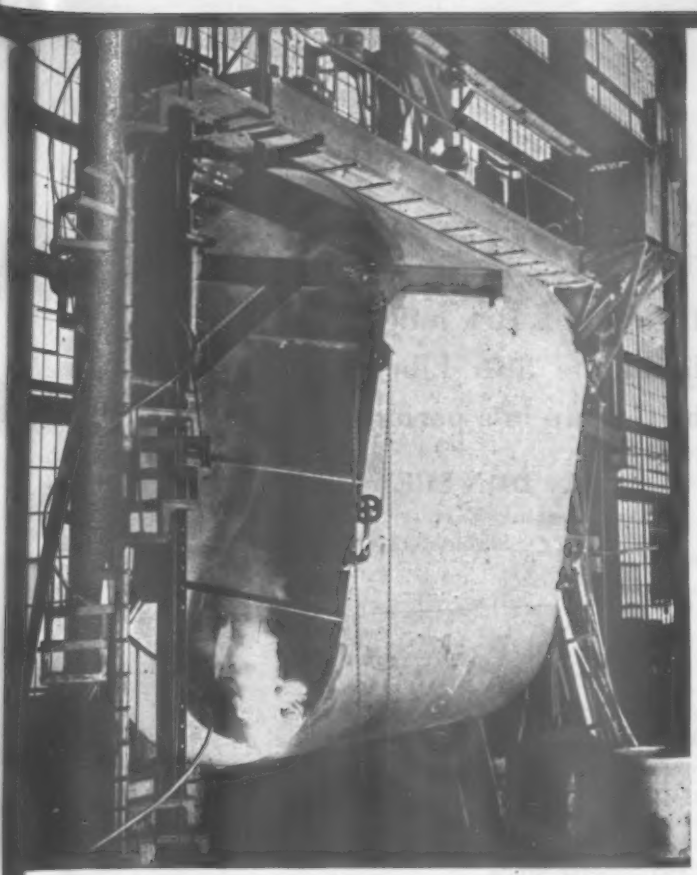


Fig. 3—The outer seam is being welded by a submerged-melt machine (top) while a welder inside deposits a back-up bead manually.

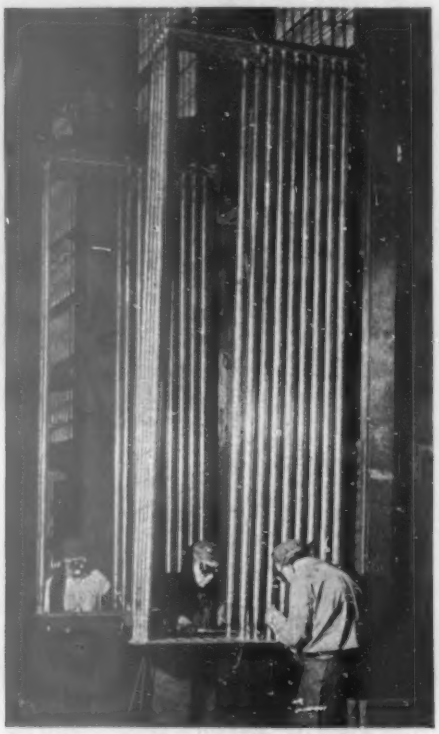


Fig. 5—Butt-welded steel tubing swaged at each end is gas welded to the headers to form the radiators through which the transformer oil will circulate for cooling.

welded seam, after which the large plate is turned over and a heavy weld is applied by automatic a-c arc welding. The resulting seams are of "bottle-tightness" and will prevent any leakage of transformer oil.

Some transformer tanks are square or rectangular; others are round or elliptical. Regardless of its shape, however, every tank is made of two pieces, which are bent on a hydraulic brake or rolled on a form roll (Fig. 2). The two halves are brought together and tack welded. The assembly is then lifted by a crane onto a fixture for welding. A machine (Fig. 3) does the outside weld automatically by the submerged-melt welding process. The machine's rate of travel is adjusted in accordance with the thickness of the plate being welded.

For thicknesses of ½ in. or more, a second pass is made after the slag has been cleaned out.

The assembly is cross-braced to size with pipes and angles, and (with the tank upside down) an angle-iron is tack welded to its top. Then the tank is turned over and welded to its base. Lifting lugs are next welded on (Fig. 4), and the openings for junction boxes and fittings are burned out with a gas torch.

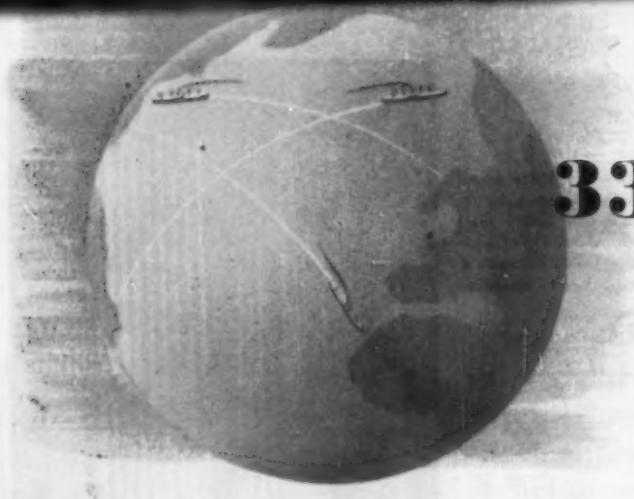
The tubes and headers for the transformer are made of rust-resisting copper-bearing steel. The tubes, approximately two in. in diameter, are swaged at each end to provide additional thickness and strength at the point where they will be welded to the header (Fig. 5).

Testing the Tanks

Two tests are used to insure "bottle-tightness" of the tank proper. The first uses air at a pressure of 3 psi and consists of applying a soap solution to check the welds. Rust, scale and the soapy solution are afterwards removed from the outside of the tank by shot-blasting in order to obtain a durable and long-lived paint job. In the second test, transformer oil is maintained at a pressure of 5 psi.

Large transformers are equipped with demountable radiators. Each radiator must pass a tightness test in which it is subjected to gas at a pressure of 80 psi.

Fig. 4—Welding lifting lugs onto a large transformer tank. These lugs may require plates as thick as 4½ in.



336 Liberty Ships

It took 14,464 miles of welding to build the 336 Liberties completed by Calship in a period of 28 months.

By **DON LLEWELLYN**
Burning Engineer, California Shipbuilding Corp.

WHEN a Liberty Ship first sails out of the Harbor, experts predict she can make about 50,000 sea miles in the next twelve months. And when the 336 such vessels built by California Shipbuilding Corp. total their sea miles for 1944, the figure will read something like 16,800,000. Break it down into days, hours or minutes if

A stack 89 miles high could be formed of the steel used to build 336 Liberty ships.

you will: 32 ship-miles a minute or 1,920 miles an hour is fabulous transportation.

In February, 1942, Calship completed and delivered the *John C. Fremont*. That month all shipyards in the nation delivered 26 vessels. Twenty-eight months later the *Martin Johnsson* went into service. Between these two dates, the shipbuilders of America completed 3,226 vessels, including Calship's 336 Liberties. More than a tenth of the total number of ships built in those 28 months thus came from Calship's ways and outfitting docks.

End-to-End Boys Figure

Calship statisticians spent several hours recently going over the things their builders have done and the materials needed for the Liberty fleet. If all the steel used in making the ships had been cut in 36 inch squares and stacked, they say, the top of the pile would be 89 miles in the air.

A haystack of the welding rods used in putting this amount of steel together would count up to approximately 371,980,000 electrodes. If this mountain of welding electrodes were deposited in a continuous seam, it would stretch over half way around the world—14,464 miles to be exact.

The building of 336 Liberty ships is likewise a big pipefitting job. It involves the installation of sufficient piping to build a pipe line from Los Angeles to Chicago—about 2,352 miles of piping.

The orange, red, gray and yellow paint for the vessels would fill 1,130,400 gallon buckets.

A 28 Mile Bridge

That is just part of the story of what 336 Liberty ships mean. Since each is 441 ft, 6 in. long, they could easily be used as a bridge to reach from Dover to the hot spot of the invasion coast 28 miles away. The tonnage these ships are capable of carrying would provide sufficient space for 22 armored divisions by merely assigning 15 ships to a division. Six ships would be left over to bring food to the people in the lands we occupy. On the other hand if we were to use these 336 ships merely to carry food, they would carry the produce of 1,279,264 average-sized farms.

A yard of 38,000 people, working 24 hours a day, completed the Liberty contracts in a little more than three years. Suppose ten men had decided to tackle the job on a 40-hour week. In another 6,000 years they, too, would be through.

If it were possible to slide one ship down the launching ways right after another, it would take an 8-hour day plus 24 minutes overtime for all 336 to clear the ways.

Calship has tried for no spectacular records in speed; the emphasis has been on the true gauge of production: overall delivery. In June, 1943, however, we delivered 20 ships in 30 days, the first time this feat had ever been performed. The outstanding ship of that record month was the *Finley Peter Dunne*, Hull 211, which went from keel laying to the hands of the operators in an unmatched 21 days.

Just One Ship

"I wonder if you realize what 10,800 tons (a Liberty Ship) really mean," asks Rear Admiral Howard L. Vickery, vice-chairman of the Maritime Commission. "It would take four long freight trains, each of some 75 cars, to carry such a load. As another example, one Liberty ship can pick up and walk away with 2,840 jeeps or 440 light tanks. In one voyage it could supply our troops 'over there' with 230,000,000 rounds of 30-caliber ammunition or 'C' rations sufficient to feed 3,440,000 men.

"The importance of the part the Liberties have played in this war can hardly be overstated. These ships, which seem to be everywhere at once, now constitute approximately a quarter of all the world's tonnage, and naturally a much larger portion of the shipping available to the United Nations. It needs no imagination to

The paint used to paint these ships would fill 1,130,400 gallon buckets.

realize that the Allied successes during this past year would have been just plain impossible without the Liberty fleet."

Calship and her sister yards share the credit of this fleet with all the

nation. As Admiral Vickery points out, "Shipbuilding records do not begin on the shipways, but in the steel mills, engine factories and boiler shops, for the modern shipyard is

Farmers, shopkeepers, housewives . . . workers recruited from every walk of life.

merely a final assembly line of a nation-wide plant. The actual construction of the world's greatest merchant marine has been the handiwork of farmers, shopkeepers and housewives, workers recruited from every walk of life to learn and carry out one of the most difficult jobs in industry. The extent of their contribution toward victory may be visualized by imagining the ships they have built since December 7, 1941, steaming in a column and spaced at mile intervals. An unbroken line would be formed extending from Maine to Scotland, or, if you like, from Dutch Harbor to Tokyo."

Supplies for 3,000,000

As American soldiers and sailors go across in larger and larger numbers, the responsibilities of the Liberty fleet mount. Each man in our overseas forces requires the transport of one ton of supplies each month. A general average for round voyages in this war is four months or more traveling in convoy. There are considerably more than 3,000,000 men in the armed forces overseas and that number is growing rapidly. Taking, 3,750,000 deadweight tons of ships as a minimum monthly arrival, we need a total of 15,000,000 tons—1,399 ships— in constant operation for the supply of overseas forces. And Calship's 3,628,000 tons of Liberty shipping fill almost a quarter of that demand.

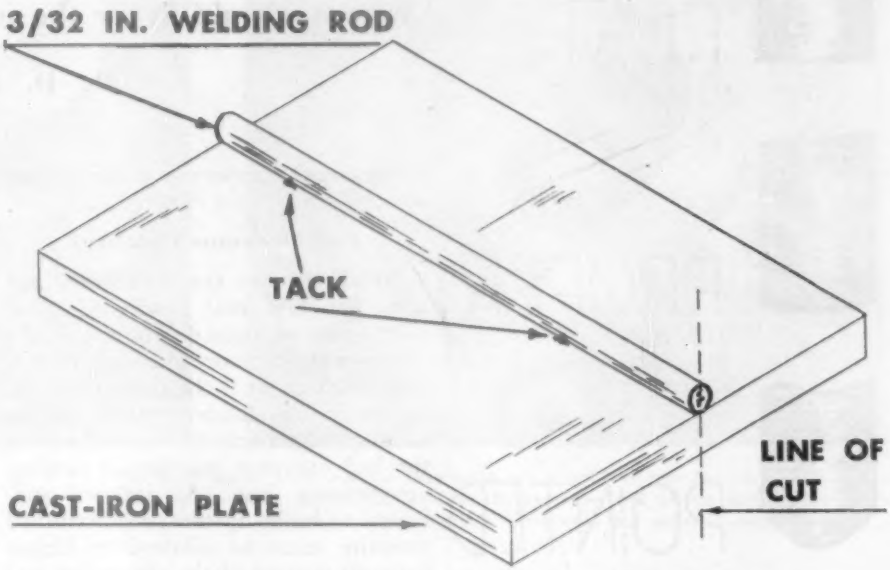
In the postwar world, the Liberty ship will be outdistanced by her swifter sisters, but there will be duties enough for her in the Merchant Marine. Says Admiral Vickery:

"I should like to see shipments booked from Minneapolis to Melbourne, for example, in a single transaction. I like to think that a world where all are better acquainted and everyone is busily engaged in producing and exchanging goods will be a happier world, in which all people may expect more security and a more peaceful way of life."

Cutting Cast Iron

An old machinist's trick makes it possible to cut cast-iron articles with an ordinary cutting torch.

By **R. A. BRADY**



A 3/32 in. bare welding rod tacked to the line of cut will permit a clean cut to be made through the plate without a special cast-iron cutting tip.

It is possible to cut cast iron with an ordinary cutting torch if it is properly handled.

In the past, weldors have found that in spite of their best efforts the melted cast iron will puddle on all flat surfaces. This, of course, makes it necessary to brush or pour off the metal from the flat surface being cut. The greatest difficulty, however, lies in the cutting of round objects such as sewer pipe or water pipe. Beads from the melted metal will form around the cut so that considerable grinding or filing is required to bring the surface to required dimensions.

Special Tips Scarce

There are several different types of special cast-iron cutting torches and special cutting tips for standard torches on the market, but priorities have made it nearly impossible for the smaller shops to obtain the required special torches or tips in sufficient quantities to meet their needs. It is only the larger concerns with preferred priority ratings who are able to secure such special equipment, and even they are having their own difficulties along this line. For these reasons, it is valuable to know that the problem of cast-iron cutting may be solved by resorting to an old machinist's trick.

The weldor should first tack a 3/32 in. welding rod to the line of cut as shown in the diagram. If he will then preheat both welding rod and the metal surface, a satisfactory cut can be made. The torch must at all times be kept in such a position that the melting rod will flow through with the melted cast iron. This will prevent puddling. Employing this procedure, any weldor can make a clean cut through a cast-iron plate similar to the cut made in flame-cutting steel.

Can Cut Rounds, Too

Round surfaces may also be cut by this method, though it is necessary, of course, to bend the welding rod around the line of cut. The preheating and cutting operations are identical to those used for flat surfaces.

Any weldor will find this simple process easy to employ and conserving of both time and metal. It is not necessary to cut a wide patch of cast iron: the line of cut will only be the width of the flame of the torch, exactly as in cutting steel. In wartime, when speed and economy are highly important factors in production and repairs, this process should be of great help to those who lack the proper facilities or necessary torches and tips for a rush cast-iron cutting job.

★ INSPECTION

Spot-Weld Inspection Methods

Fig. 1—Three types of electrode-tip profiles.

The policies and personnel of "Inspection" contribute as much to the quality of the individual weld as the operator's ability or the perfection of his equipment.

By **D. J. RAHN**

THE PROBLEMS involved in spot-weld inspection embrace all the factors of general inspection plus the complex task of judging the quality of the spot weld. The first and most obvious responsibility of the inspection department is, of course, to protect the customer and uphold company standards. It is the duty of Inspection to see that material meets the company standards and specifications contracted for, and it is no less its responsibility to see that unreasonable or unnecessary demands of the customer's field representative are tactfully avoided. To polish a hidden part which will function equally well without polish or to devote time to improving the appearance of an article beyond specifications consumes unnecessary labor hours and boosts costs.

A tabulation of the errors of production probably ranks next in importance. An accurate account should be kept of each weld rejection for the purpose of bringing these errors to the attention of Production. If this practice is not observed, the same type of errors will be repeated over and over, wasting inspection labor, production labor and materials. When an authentic record of errors is kept by inspection supervision and handed to production supervision, the errors may be traced and rectified.

Bad Operator Practices

Nowhere does the regrettable but none the less real indifference (in some cases outright deception) of the operator appear more glaringly than in spot welding. It is the inspector's job to check this hidden factor to the utmost. Particularly prevalent is the bad operator practice of beating air-pressure time. An interval sufficient to build up the predetermined pressure must be allowed to elapse between contact of the electrodes and the application of the current.

On some welders the proper intervals are provided by an electronically controlled sequence panel. In sequence timing, a device is employed which divides the welding operation into four steps: (1) When the solenoid valve is closed by the operator and pressure is brought to the predetermined pounds, the pressure switch closes. This constitutes the initial phase or "squeeze time" and assures the maximum air pressure value. During this period the electrodes are together. (2) The second step, "weld" time, is, of course, the time in which the current flows. (3) After the weld is actually made, an extremely important phase occurs called the "cool time." Here the electrodes remain together after the current has stopped, allowing the weld slug to cool. (4) "Hold time" regulates the time between welds in intermittent or pulsation welding.

On machines unequipped with sequence timing, the weld inspector must be constantly alert to the possibility of the operator beating any of the various time phases. Furthermore, operators may, on all types of welders, alter the devices controlling the air pressure to the tool. Even sequence timing may be altered, in the hope of speeding up the work, if the sequence panel is not enclosed in a locked housing.

The importance of accurate air pressure cannot be overemphasized. The weld made with insufficient pressure may show surface spitting, distortion and discoloration. In appearance, it is often confused with a weld made with too much heat.

Tip Profile Important

The dials and gauges which control the current, time and pressure variables are readily checked by the inspector; however, another almost equally important variable is very difficult to check because it changes with every weld. This is the tip profile.

A mushroomed electrode will result in a weld of too large diameter and of insufficient heat (due to lower current density) with consequent poor fusion. Operators, however, are frequently neglectful and indifferent in tip dressing. Nothing short of laboratory tests on a sheet of the metal and thickness being used can accurately indicate how often tips should be dressed. This information, however, must be determined and made known to both the inspector and operator.

Fig. 1 illustrates the proper as well as the pointed and flat types of tips. A file shaped to the desired radius (a flat file is preferred by some) should be readily available to the operator. Fine-grit emory paper should be applied after filing in order to smooth the tip surface.

In his observations, the inspector should be on the lookout for set-ups with a tendency to throw the electrodes into contact with the work at any point other than the tip. Electrodes designed for replaceable tips should also be watched since dirt in the threads by which the tip is screwed in will add an internal electrode resistance that may affect weld quality. The writer observed one operator attempting to tighten the fit of a tip thread by inserting a piece of string the entire length of the thread. The result was, of course, perfect insulation. The kindred practice of using lead to seal a water

Fig. 2—A special weld inspector operating a pulling machine. The specimen has been inserted and is being pulled, but it has not yet broken.

Fig. 3—A special weld inspector shearing a test weld (see also Fig. 6). To her left is the grinding wheel she will use to polish the specimen, and on the shelf is the bottle of acid which will be applied to etch the sheared and polished cross-section.

leak should never be tolerated. The entire length of the current-conducting electrode should be copper and only copper.

Visual Inspection Difficulties

The majority of spot welds must be inspected visually, and it is of utmost importance that a definite and rigid standard of weld perfection be maintained within the inspection department. As in all visual inspection, the opinion of the less experienced inspectors frequently differs from company standards or from the opinions of other inspectors, causing confusion and unfairness to the production department. While the standards of perfection are constantly being raised, every effort should be exercised at the start of a job to cover them entirely so that Production will be deprived of its usual complaint that "Inspection has found something new to pick on." For the same reason, everyone involved should be notified whenever standards have been altered. Too often the new specifications are kept a dark secret between production supervision and inspection supervision. Frequently, too, the customer-representative will give instructions to the inspector, whose instructions, of course, should always come from the inspection supervisor.

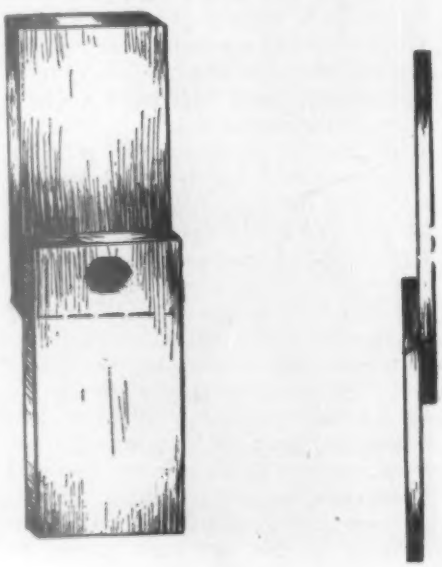
No discussion of these responsibilities can be complete without a warning to Inspection to guard against assuming too much authority. To know and to recognize the limits of inspection duties is as important as to recognize the inability of the production department to pass on the merits of its own work. Power can grow on Inspection until it is entirely out of bounds, and the department takes on complex and unrelated duties. A simplified inspection procedure makes for economy and efficiency.

Special Weld Inspectors

The intricacy of the electronically controlled welder, the complexity of the weld itself and the virtual impossibility of judging a spot weld by appearance alone all prove the necessity of special weld inspectors furnished with suitable equipment (Figs. 2 and 3). Some authorities contend the weld inspector should be capable of expert operation of the spot welder. Other persons, including the writer, hold that the inspector's ability to do the work is of little consequence and are inclined to favor the weld inspector who has had no welding experience. Such an inspector is less likely to feel the limitations facing the operator—rates, production speed-ups or physical working conditions—and is thus less inclined to be swayed into overlooking an error. A good weld inspector serves only one master, Inspection.

The fact that the inspector need not have had past experience as an operator does not excuse lack of familiarity with the details of his job. He must know the metal thickness of each piece of work under his jurisdiction and must have knowledge of the controls which will make a weld of predetermined strength and uniformity. He should be capable of recognizing variations in the current, time and resistance and trace

Fig. 4—Test specimen or pile-up. Sufficient area is left protruding to permit its attachment in a pulling machine of the type shown in Fig. 2.



their sources. He should also recognize the variations of resistance in the weld zone caused by tip contour, electrode force, metal fit of pile-up, surface conditions of metals (cleanliness), angle of the work to electrode and others. He should be qualified to call these conditions to the attention of the welding supervisor and to give helpful suggestions to the operator. It is certainly not Inspection's job to teach welding; still the weld inspector is a logical person to impress on the operator the importance of dressing the tips frequently and adhering strictly to the weld pattern.

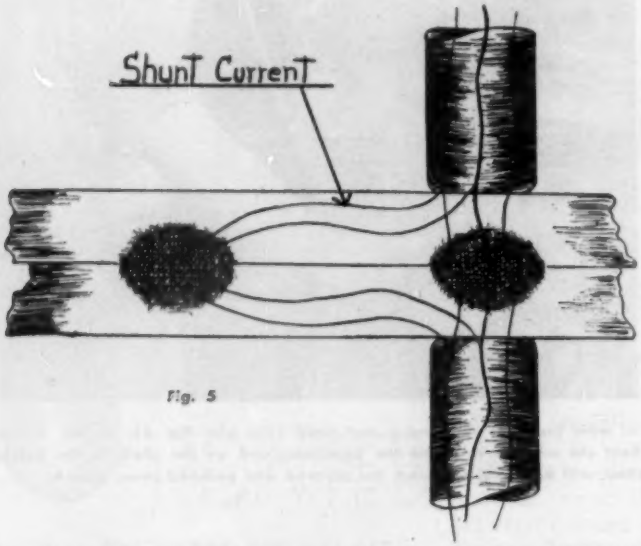


Fig. 5

Fig. 5 (left)—The first weld made on this sample is disregarded since it does not reveal the effects of the current shunted to second spot.

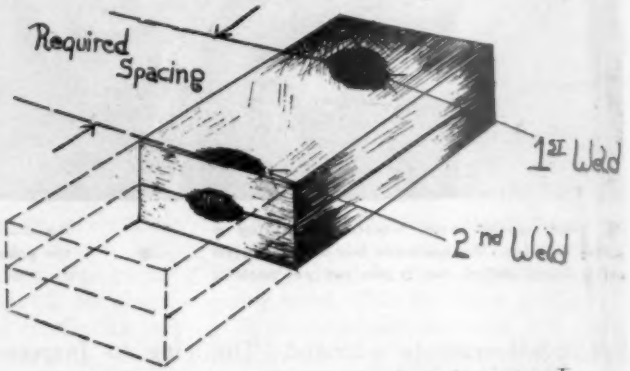
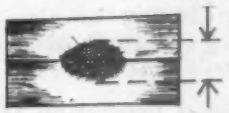


Fig. 6

Fig. 6—How a cross-section of the second weld is cut for the etching test. Half of the weld nugget must be included.



Tack-Welding Problems

The special weld inspector should know thoroughly the conditions of all tack-welding equipment. Having a minimum of controls, tacks usually require constant attention. A responsibility of the inspector is to see that tacks should never be placed where they may affect the stress points or at the edges of metals and that they never show surface spitting. The inspector should constantly impress on the operator the absolute necessity of keeping the work at a right angle to the tacking electrodes.

By careful observation of the conditions under which the work is being done and the appearance of the weld, the inspector is generally able to tell bad work. However, he can never tell positively, by visual means alone, that the weld is good. He learns the appearance of a weld which may lack sufficient fusion, and he can tell a weld that looks as if it were too hot or has been welded with insufficient pressure. Only by testing devices, however, can he determine the weld strength.

Since, obviously, material for delivery to the customer cannot be submitted to destructive tests, test samples or pile-ups must be used. It is of the utmost importance that actual working conditions be duplicated as nearly as possible on these test metals. A mere similarity to working conditions is not enough.

The contour of the metals should also be considered. Flat test metals with a perfect fit are no indication of the quality of weld being made on, say, a collar welded to a piece of 5 in. tubing of dubious alignment. Perhaps the electrode pressure is sufficient to produce a good weld on the test metals but is not sufficient to weld the pieces with a poor fit. Furthermore, a large piece of material being held within the magnetic field by the operator cannot be successfully duplicated with a 3 in. test sample.

Operators should not be permitted to weld at the start of each shift (or whenever conditions vary) until tests have been made. The accepted method of making tests is to spot weld sample metal sections that duplicate the actual work as closely as possible, allowing an area to protrude to permit the attachment of a pulling device (Fig. 4). If the job calls for more than one weld, at least two welds must be made on the test sample. The first weld made is disregarded in the test, for in this the current passes directly from one electrode to another and so the weld is not representative of subsequent welds in which current is also shunted to adjoining spots as shown in Fig. 5. It is important that the weld spacing of the work be accurately duplicated on test specimens.

Etch Tests

In addition to tensile tests, welds may be submitted to an etch test. Here a cross-section of the second weld is produced by cutting the sample so that half of the nugget is left (Fig. 6). The cut sample is filed, polished and dipped in an acid solution until the weld slug is clearly revealed. A magnifying glass may be necessary to see clearly weld etches in metal of thickness less than 0.030 in. In ordinary inspection, the naked eye or a magnifying glass are all that are needed to determine the the penetration of fusion. If a more thorough examination of the weld is desired, a high-powered microscope, magnifying up to 2,500 times, will reveal the metallurgical structure of each of the several weld zones.

In an ideal weld, the etched weld slug should show a penetration of more than 50% but less than 100% of the thinnest outer sheet. Every weld on a job need not have this degree of fusion, but a high test standard will insure a reasonable margin of safety for the sum total of welds in the finished material. After the tests have been made, the results should be checked against values predetermined by the weld laboratory. Charts for ready reference giving the desired heat, pressure, time, tool, metal thickness and job specifications will save inspection and production labor.

These are only the highlights in spot-weld inspection. The importance of complete coöperation of the production, welding and inspection departments cannot be overemphasized. Just as Inspection has the right to analyze Production, so Production has the right to criticize and examine the methods of Inspection. Inefficient inspection can hamper a job or obstruct the progress of a plant as surely as deliberate sabotage.

★ MAINTENANCE

Repairing a Cast-Iron Valve

Pitting effects of erosion were overcome by combining arc welding and metallizing on a large cast-iron, bronze-seated relief valve.

By **GALEN F. BIERY**
Seattle City Light Dept.

Fig. 1 (left)—this picture was taken just after welding started. Note the many pitted cavities.

THE ACCOMPANYING pictures show two views of a large cast-iron relief valve with a bronze seat. The seat was worn from several years of use, and the cast-iron portion was pitted in irregularly shaped patterns as shown in Fig. 1. In some places these extended to a depth of an inch or more. This type of erosion is common on water wheels, propellers, etc. Engineers are not agreed as to what causes it, but the pitting is known to occur where the water leaves the affected area.

The affected areas were first chipped clean, and an attempt was made to fill the cavities by spraying them with stainless steel. Even though electric bonding was used, this method was not successful as the sprayed metal contracted and pulled loose from the cast iron. The sprayed metal was therefore removed, and the valve put in a lathe so that a small cut could be taken off its entire surface, including both the cast iron and the bronze seat.

We now employed the arc-welding process, using a fabricated rod having a copper core surrounded by a sheath of nickel and an outer sheath of mild steel. Fig. 1 shows how the weld metal was introduced to fill the cavities. All of the cavities were filled, and a layer of metal deposited to cover the entire surface smoothly. Small beads were laid, and the deposits were peened frequently. This method relieved the strain of contraction and prevented overheating.

After all of the weld metal had been deposited, the valve was placed back in the lathe and turned to just undersize. Next it was sprayed with stainless steel, and the bronze seat was sprayed with bronze. The finished job (Fig. 2) is solid and looks fine, but time alone will be able to tell us the value of the sprayed metal.

Fig. 2 (below)—Finished job. The cast-iron portion was sprayed with stainless steel, and the bronze seat was sprayed with bronze.

★ TRAINING

By G. F. MULLIGAN
Welding Inspector, Metropolitan Body Co., Bridgeport, Conn.

His first Navy test is one of the green weldor's biggest psychological hurdles. This test is the most widely used in the U. S. to qualify metal-arc weldors, yet the novice weldor will have difficulty in getting a clear, concise outline. This article tells what he needs to know about

Navy Qualification Test No. 1

At the present time the most widely used test in the United States for the qualification of metal-arc weldors is undoubtedly the Navy Department's test number one. The rules under which this test is conducted, as well as the evaluation of the results, are laid out in the department's "General Specifications for the Inspection of Materials, Appendix VII, Welding Part E, Section E-1, Qualification Tests for Metal-Arc Weldors," the issue of March 15, 1943, being the one currently in effect.

Help for the Novice

In spite of the widespread use of this test for qualifying weldors in shipyards, steel fabricating shops or other manufacturers who do welding on Navy material, it is not easy for a novice weldor (or an experienced one for that matter) to get a clear and concise outline of the test and of sound methods for conducting and taking it. It is the purpose of this article to supply this needed information in a simple and direct manner.

The article is aimed frankly at the novice weldor who faces the imminent probability of taking his first Navy test after but a few months' experience. Even veteran weldors, however, may find in it information which will add many details to their general knowledge of the test as gained through experience.

Test number one may be taken in the flat, vertical and overhead positions with many different kinds of base material. This discussion, however, will be confined to the welding of mild (low carbon) steel in the flat position since this is almost without exception the base material and position in which the inexperienced weldor will take his first Navy test.

The weldor who successfully passes test number one in the flat position on mild steel is qualified to weld in the flat or downhand position and to weld horizontal fillets on plates, shapes and bars conforming to any of several Navy Department specifications, but limited to ¾ in. thickness. A weldor who has once qualified on any Navy Department test need not repeat it unless the inspector has reason to believe his work has deteriorated below the standard of quality shown on his test plate, unless the weldor has not been engaged in welding of the type for which he was qualified for a period of more than three months or unless he changes jobs.

New Job, New Test

This Navy test is as much a test of the equipment used as of the ability of the operator. For this reason a test taken for an employer is good only while in his employ, and the weldor who changes jobs is compelled to requalify with the equipment used by his new employer. Copies of the record of a weldor's certification are the joint property of the employer and the Navy Department, and usually no copies will be furnished to the weldor.

Either d-c or a-c welding may be used in Navy tests. A strong impression exists in uninformed welding circles that the Navy department frowns on a-c welding. Nothing could be further from the truth. The current issue of the specifications states that passing a test with d-c equipment qualifies a weldor to use d-c equipment only; passing it with a-c equipment, however, qualifies him to use both types of machines. For this reason it is desirable for shops using both types of equipment to qualify all their weldors with a-c machines.

Electrode Specifications

The electrodes used in this test must conform to Navy Department specification 46-E-3 formerly 22-W-7. These electrodes conform, in most respects, to AWS specifications E-6010, E-6011 and E-6012.

Specification 46-E-3 includes electrodes of both d-c and a-c types divided into grades and classes. Reversed polarity electrodes (with the electrode on the positive side of the circuit) are used on d-c machines. Some, but not all, of the standard brands of this type are: Lincoln Electric Co.'s "Fleetweld 5," Champion Rivet Co.'s "Blue Devil," Air Reduction Co.'s "Airco 78," General

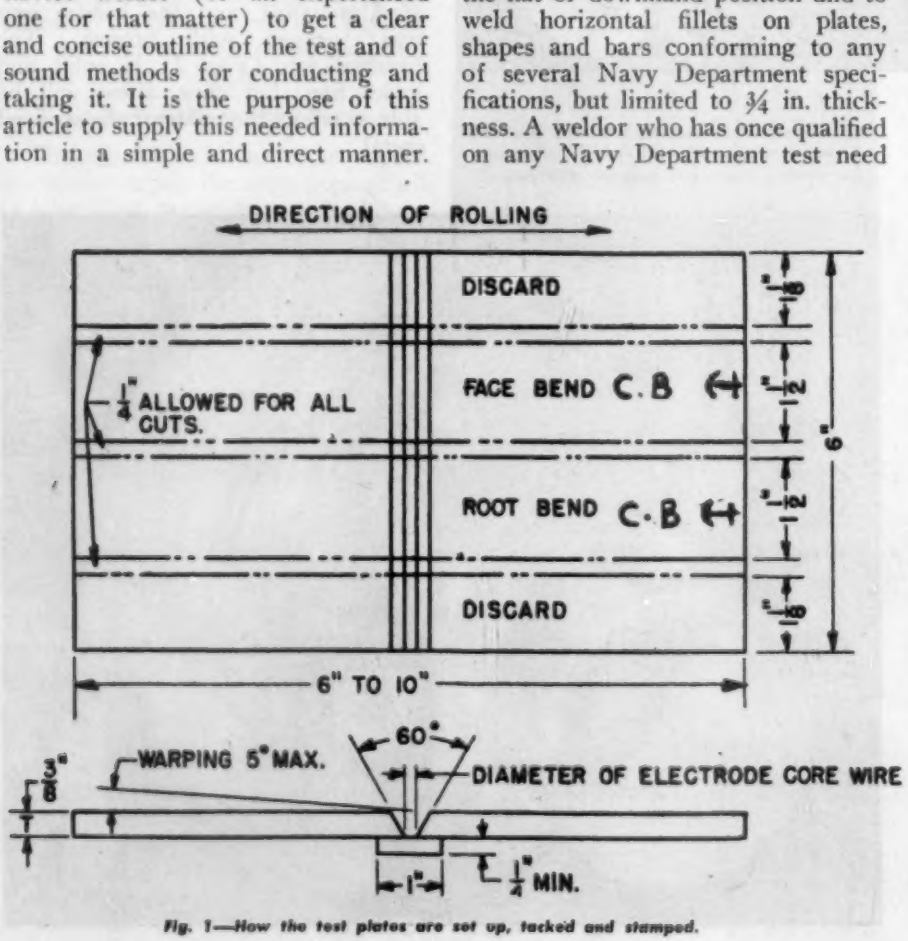


Fig. 1—How the test plates are set up, tacked and stamped.

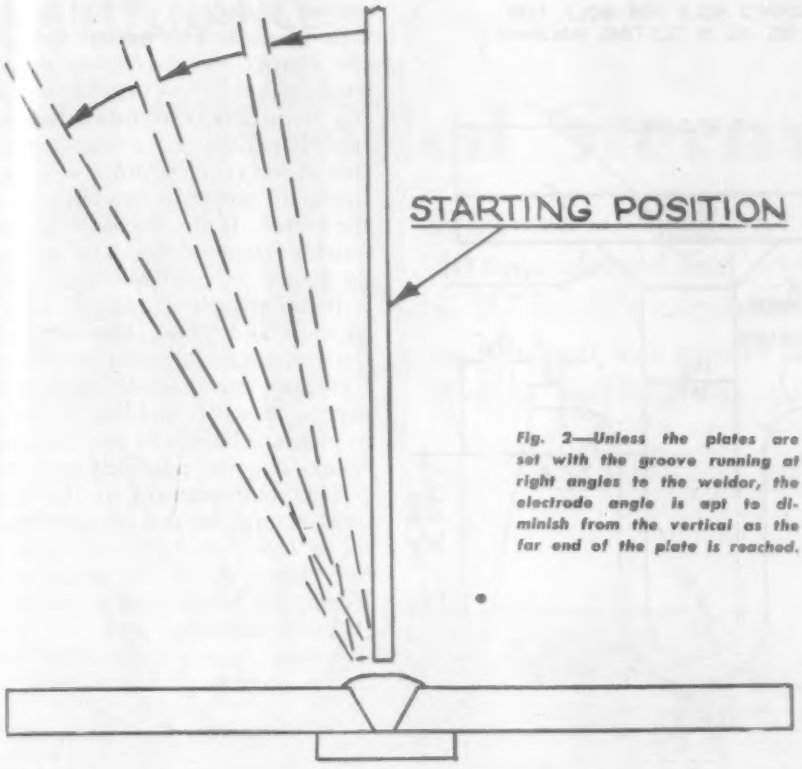


Fig. 2—Unless the plates are set with the groove running at right angles to the weldor, the electrode angle is apt to diminish from the vertical as the far end of the plate is reached.

Electric Co.'s "W-22" and "W-22F," Harnischfeger Corp.'s "Smootharc AP," Hollup Corp.'s "Sureweld B," Metal and Thermit Corp.'s "Murex Vertex," American Chain and Cable Co.'s "Page Hi Tensile C" and Wilson Welder and Metal Co.'s "98N" and "98N V&O." As a general rule, the Navy Department does not allow the use of straight polarity rods.

Some of the standard brands for use with current supplied by a-c transformer-type sets are A. O. Smith Corp.'s "SW-15," Metal and Thermit Corp.'s "Murex Alternex," Wilson Welder and Metal Co.'s "530," Marquette Mfg. Co.'s "151," Hollup Corp.'s "Sureweld F," General Electric Co.'s "W-26," Champion Rivet Co.'s "Bluedac" and Air Reduction Co.'s "Airco 230."

Electrode Sizes

The maximum size electrodes used in the shop's production work must be used in taking the flat test, but no size larger than 3/16 in. can be used for the root pass. This same rule applies to the test in the vertical and overhead positions except that 3/16 in. will be the maximum electrode size permitted to be used in these two positions and (with the exceptions noted) the Navy Department makes no distinction between the root pass and the other passes.

The electrode size, that is the nominal diameter of the core wire, also determines the width of the root opening at the bottom of the groove. Thus if 3/16 in. rods are to be used for the test, there must be a 3/16 in. space between the feather edges of the bevel on the plates.

The test plates are set up, tack welded and stamped as shown in Fig. 1. Extra care taken to make certain that the plates are tight against the backing strip will pay dividends in test results.

Weave Technique Best

Navy Department specifications do not limit the number of passes used to make the weld nor are any current settings specified. The Department does control these factors to a certain degree, however, by specifying that the plates shall not warp more than 5 degrees from flat. In most cases it is easier for the inexperienced operator to make a downhand weld in stringer beads or multiple passes, but it is very difficult for him to keep the plates within the warpage allowance when this technique is used.

Therefore it is advisable on the Navy test to complete the weld in the minimum number of passes by using a weave technique. Another factor contributing towards the superiority of the weave technique is that this test is primarily one of ductility, and weld metal deposited by weaving is generally recognized as having a higher ductility than metal deposited by the stringer method.

Sideways vs. Back and Forth

Experience has shown that a large majority of weldors begin welding with the plates set before them with the vee-groove running in a left to right direction. The author believes that a clearer and better view of the whole joint is obtained if the plates are set with the groove running at right angles to the weldor, who progresses either towards or away from himself as he prefers. One defect in using the left to right position is that unless the weldor bends far over the plate (an unnatural position) he will have a tendency to deposit more metal on the far side of the groove because that is the easiest to see.

Another drawback is a tendency to change the electrode angle. The weld is usually started with the electrode held at a 90 deg angle to the plate (the best position), but many weldors will unconsciously lower the angle of the rod as they progress left to right (or vice versa), until the rod is being held at a 50 or 60 deg angle at the end of the groove. This is apt to result in incomplete fusion at the edge of the bevel on the far plate. Fig. 2 shows how the electrode angle progressively changes from the vertical starting position.

The left-to-right method may be successfully used if special care is taken to obtain a good view of both beveled edges during welding and if the electrode is maintained at a 90 deg angle to the plate for the whole length of the groove.

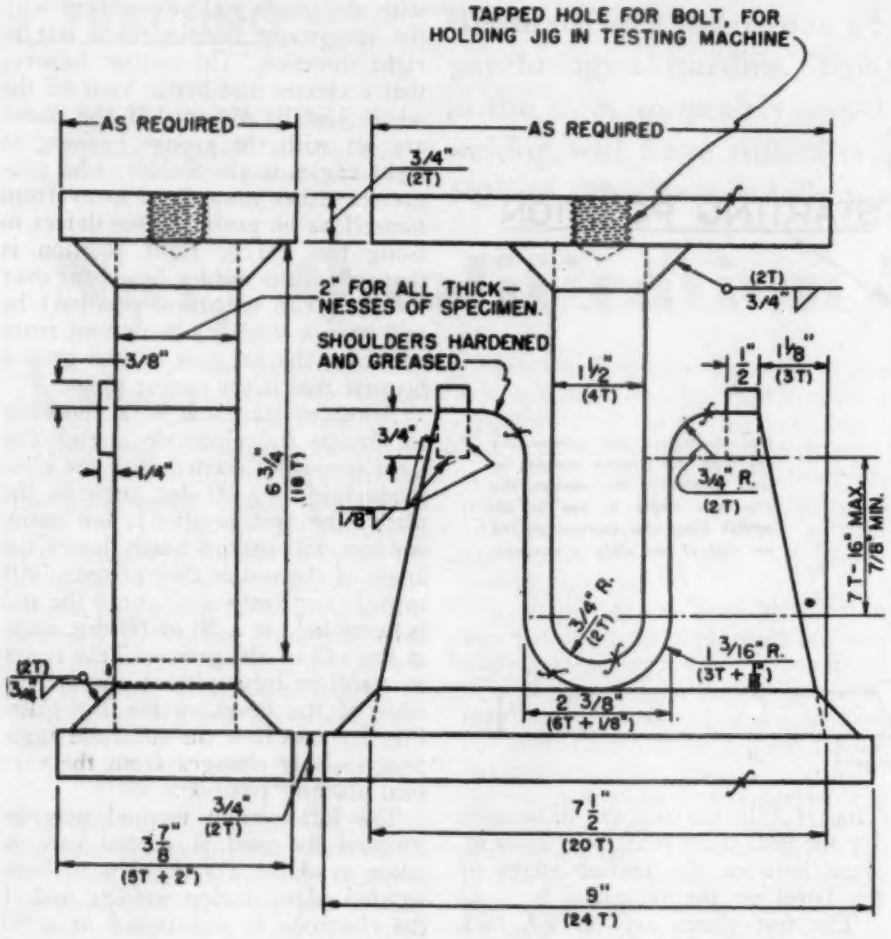
The Root Pass

The root bend is the most important part of any test, and by far the most failures occur when the weld coupon is bent with the root in tension. A current setting 20 to 30 amp higher than ordinarily used is advisable in depositing the root pass, and a heat discoloration line on the opposite side of the backing strip is a good indication of satisfactory penetration.

Penetration into the backing strip, however, while essential to a good root bead, is not the only factor to be considered; fusion into the sides of the bevels is equally necessary, if not more so. Examination of many test specimens discloses that incomplete fusion at these points is one of the most common causes of failure.

The importance of cleaning each bead before depositing the next cannot be overemphasized. Most inspectors will allow the plates to be removed for cleaning; many will allow the use of a gouge or diamond-point chisel to level off ridges and chip out holes. If this is permitted, full advantage should be taken of it since a clean, level bead is much easier to weld on than a ridged and grooved one.

After depositing the first bead,



NOTES:

1. T = THICKNESS OF TEST SPECIMENS.
2. SPECIFIC DIMENSIONS ARE FOR 3/8" TEST SPECIMENS.
3. HARDENED ROLLS MAY BE USED ON SHOULDERS IF DESIRED.

Fig. 3—Jig for bending the test coupons.

the novice weldor is usually anxious to remove the slag to see how the weld looks. It would be advantageous for him to curb his natural curiosity and allow the weld to cool with the slag covering it. Slower cooling permits the grain size of the deposited metal to "grow down" to a better structure for the bend test.

The test specifies that no weld metal shall be deposited while the temperature of the plate is above 212 F. As this temperature is the boiling point of water, a simple method exists for determining whether or not a plate is cool enough to permit resumption of welding. Simply place a drop of water upon the discarded portion near the weld; if it does not boil the plate is ready to receive the next bead.

Careful deposition of the second or semifinal pass will go a long way towards assuring a smooth even finish on the completed weld. First of all, a downward adjustment of the current from the abnormally high heat of the first pass is advisable. This helps to compensate for the heat that remains in the plate. The second pass should be deposited with a weave and the metal laid heavily enough so that the groove formed by the bevels is almost filled and the crown (convex part) extends very slightly above the level of the plates. This slight protrusion can be used as a guide in controlling the width of the last pass.

Final Pass

The last pass is deposited with a weaved bead and should have a maximum thickness of one diameter of the rod used. A further and more substantial reduction in amperage will aid greatly in eliminating undercutting and improve the appearance of the finished weld.

The first two passes can usually be completed without changing electrodes, but two rods are usually consumed in putting on the final, fully weaved pass. The author thinks that the change of electrodes should be made as quickly as possible and welding immediately resumed before the molten puddle has a chance to cool; this is very much preferable, he believes, to stopping to chip and clean the crater. If the electrode is changed quickly enough, the slag can easily be floated out and welding continued without impairing quality. Time out to chip and clean, however, allows the crater and adjacent area to solidify, and considerable skill will be necessary when welding is resumed to pick up the weave and obtain good fusion into the relatively cold crater.

The reinforcement of the finished weld should be not greater than 1/8 in. or less than 1/32 in. higher than the plates. After the weld is completed, the temptation to remove the slag immediately may be greater than ever. Again, it should be resisted in the interests of a good weld.

Preparing Test Coupons

The backing strip is removed in the machine shop on a planer, shaper or similar device; the strokes of the cutter are made transverse to the weld. The reinforcement is removed in the same manner, care being taken in both instances not to remove any of the parent metal. Any undercut appearing on the face side shall remain in the plate. Machine tool marks are removed with a fine emery cloth, and the coupons are machined or saw cut from the plate, never flame-cut. The edges are rounded off with a file and emery cloth to a maximum radius of 0.0625 in. in order to prevent the possibility of a progressive break starting from the concentration of stresses at a sharp edge.

The coupons are bent in a jig having a contour similar to that in Fig. 3. The coupon with the poorer appearing root bead is selected to be bent with the root in tension. The specimen is placed in the jig with the root bead up and the weld centered over the male member. The latter is forced into the female member by a hydraulic jack or other suitable means until a 1/32 in. wire cannot be placed between the specimen and any point on the curvature of the male member. The same procedure is followed on the remaining coupon except that the face instead of the root is in tension.

Any specimen in which a crack or opening exists, either before the bending or resulting from the bending, will be rejected as unsatisfactory, provided that the crack or opening exceeds 1/8 in., measured in any direction.

★ MAINTENANCE

Welded Sternwheel Shaft

A broken steel shaft 31 in. in diameter and weighing 40 tons offered real problems, but the shaft belonged to the world's largest towboat and had to be repaired as the boat was vitally needed on the Mississippi. So thermit welding was called upon to do this big task.

Fig. 1—Before making the repair, the entire sternwheel assembly was removed from the towboat Sprague and placed on a barge.

HEAR that whistle blow! There's a steamboat round the bend!" Those familiar words of the 90's are coming back along the Mississippi. Ole Man River is carrying more freight than ever before, and river traffic, like rail traffic, is loaded to capacity.

No Time Out for Towboats

All kinds of war materials are moving along the river, but the principal and most important items seem to be refined petroleum products, particularly high-octane gasoline and diesel oil. Towboats with bigger tows than ever before are plying up and down the river. There is little time out for maintenance, but, fortunately, not much time out is needed. The advantageous use of welding helps to keep these huge towboats on the go continuously. Welding and flame-cutting equipment, a very necessary part of the machine shops on these boats, render it easy for the crew to make the necessary repairs to keep things shipshape while they are lying in port for cargo transfer.

Occasionally the repair job assumes such magnitude as to become more than a mere lay-over job. Even in these instances, however, welding is found to be an effective forwarder of quick repairs. Such an instance recently occurred in connection with the steamship *Sprague*.

The *Sprague*, the world's largest towboat, is one of the fleet of Standard Oil Co. vessels engaged in pushing barges up and down the Mississippi River. While the towboat was engaged in this all-important work, its sternwheel shaft broke in two places. This shaft is 31 in. in diameter and weighs 40 tons. To break such a massive piece of metal seems a next-to-impossible feat. Nevertheless, the shaft *was* broken, and the towboat was consequently doomed to uselessness until a replacement could be obtained.

But the Boat Was Needed

Present day conditions in foundries and forge shops made it more or less out of the question to obtain a replacement shaft within a period which might be considered a "reasonable" delivery date. What could be done? The services of the *Sprague* were sorely needed, and every minute of delay could be readily translated into so many gallons of 100 octane gasoline for our bombers, fighters and transport planes in Normandy, Italy and the islands of the Pacific which we are now wresting from Jap hands.

Could the shaft be repaired by welding? Welding engineers, experts in thermit welding, were called in to survey the broken shaft. Yes, they concurred, a repair by this process seemed plausible. Because of the scope of the job, however, considerable preliminary preparation was necessary.

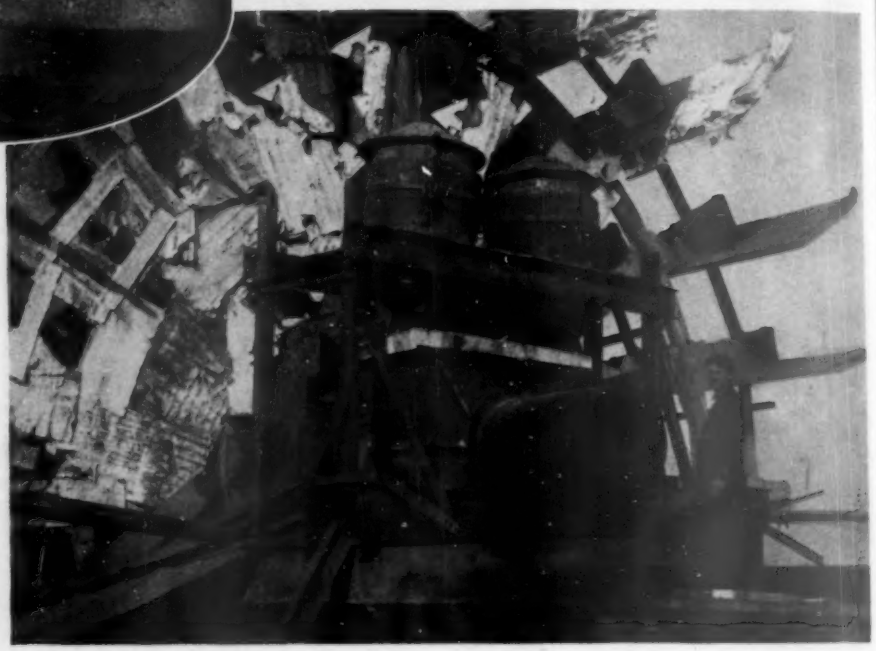
Repair on a Barge

The entire sternwheel assembly—shaft and buckets—was removed from the *Sprague* and placed on a barge to facilitate the making of these thermit-welded repairs (Fig. 1). The wheel was placed on the barge resting on its bucket boards. Since this natur-

Fig. 2—Some 10½ in. of steel had to be cut through to sever a partial break.

Fig. 3 (left)—Lining up the shaft prior to welding. Note the use of straps tacked at 90 deg intervals around the shaft.

Fig. 4 (below)—Crucibles in position after the mold box has been built around the shaft



aily placed the shaft some distance up in the air, scaffolding was necessary. Cribbing also went under the outer ends of the shaft to provide an adequate means for alignment. Not until these preliminary preparations were completed were the actual steps toward thermit welding undertaken.

Of the two breaks, the one near the end of the shaft was only a partial break while the other, nearer the middle, was a clean break. Severance of the partial break was completed by flame-cutting. Inasmuch as the shaft was hollow (Fig. 2), this was not too difficult an operation. It involved the cutting through of only 10½ in. of steel. After the shaft had been cut in two, the edges of the break were squared up so as to provide a neat surface for thermit welding. Even though a fracture may run diagonally, it is advisable when cutting it out to make it run as nearly vertical as possible since this will insure a free flow of thermit steel between the parts.

Cleaned by Flame-Cutting

The next step in the welding operation was to clean the sections thoroughly for a space of at least 5 in. so as to expose clean (but not bright) metal on each side of the fracture. In this particular instance, the cleaning was accomplished by a light skinning flame-cut, which removed scale, rust and other dirt. Considerable care was taken to remove all dirt and grease as far back as the mold box might extend so that when the mold was rammed and the heat applied there would be no grease to burn out and leave a void between the mold and the parts being welded. Particular care was also taken to remove all of the oxide and scale left on the parts from the flame-cutting operation.

by 2 by 6 in. were tack welded at 90 deg intervals around the shaft (Fig. 3).

The Wax Pattern

The shaft was then ready to receive the wax pattern. The customary yellow wax was employed to make a thermit pattern and was shaped around the parts to be welded so as to form a collar. The opening between the ends was filled with wax, and the necessary vent hole through the wax, extending from the location of the heating gate to the riser, was provided. The latter was accom-

A sand plug was next inserted in the hollow section to serve as a core during the welding operation and insure the maintenance of a hollow shaft. This kept the weld metal out of the center section yet provided a plug that could be readily removed after the welding had been completed.

Since the fracture in the central portion of the shaft was not square, about 1¼ in. of material were removed during the flame-cutting operation. In addition, it was necessary to provide about ½ in. of space for weld metal contraction. In view of this, the two ends of the shaft were placed about 2¼ in. apart. One of the most definite advantages of thermit welding for a large weld of this type is that all of the weld metal is deposited at one time. Consequently, only one shrinkage is involved, and stress relieving is unnecessary.

Tack Weld Straps

To assist in the maintenance of shaft alignment during the set-up of mold boxes, crucibles, etc., straps ¼

Fig. 5—The final operation was to flame-cut the gates and risers from the welded shaft.

Announcing A WELDER

for STRUCTURAL ALUMINUM

Companion model to the highly successful Progressive Model "B" the new model "C" for welding structural aluminum and alloy sections by stored energy embodies all the features which have contributed so much to the outstanding performance of the lighter model in welding Alclad between 0.016 to 0.081 ST.

These include the throwing of all rocker arm deflections into the vertical plane to provide a "spring follow up" during the weld, improving weld quality; a triple pressure system providing normal welding pressure, maximum welding pressure (after capacitor discharge) and a light pressure for point dressing. Outstanding too, is the rigidity of the machine.

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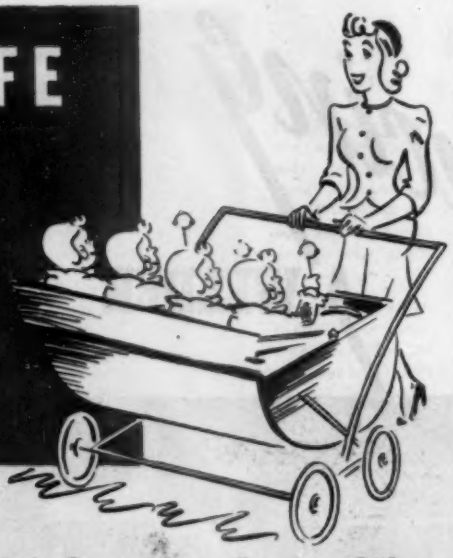

. . . on ship builder's steel welds

Once again Cortland Grinding Wheels go into a War Production Test against competitive wheels—*and win out by a wide margin.* This time they tackle the tough job of cutting and grinding steel welds on steel plates for a New York State shipbuilder—and they cut and grind *four times as many welds as the wheel formerly used!*

HERE ARE THE PRODUCTION TEST FACTS:

WORK: Steel welds on steel plates for deckhouses. *Material:* hard, bullet-resisting steel. *Size:* 5 feet by 10 feet. *Machine:* Chicago Pneumatic Tool-Air Grinder. *Wheel Speed:* 4200 R.P.M.

RESULTS: 2200 pieces were ground by the Cortland Type 11 Resinoid 6" diameter Flaring Cup Grinding Wheels. Average life of wheels was three weeks, or four times more than that of competitive wheels, which were of the same general type and size.

Almost invariably Cortland Grinding Wheels for all types of work can improve your present production in speed, efficiency and more work per wheel. Why not let us make tests and recommendations . . . without cost or obligation?

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For better Weld Grinding

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plished by imbedding a ¼ in. cord in the wax and pulling it out after the pattern had been formed.

From the amount of wax used, it was possible to determine the amount of thermit steel that would be required for the weld. Previous experience has shown that for each pound of wax approximately 25 lb of thermit mixture will be required. This estimate provides ample thermit steel for the pouring gates and risers as well as for the weld proper.

After the wax pattern was in place, the mold box was built around the shaft, filled with a Welsh clay mixture and rammed into place. When the mold had been completed, the wax pattern was melted; at the same time the mold and the shaft ends were preheated.

Ignition of Thermit

The next step was to place the special thermit mixture in the pair of crucibles over the mold box (Fig. 4). This mixture was designed to match the shaft material in strength. The thermit material was ignited, and the molten weld metal was then tapped. Flowing into the mold, it fused around the shaft to make a strong, durable weld. The mold boxes were then removed to expose the gates and the risers (Fig. 5), which were then flame-cut from the shaft in the final operation.

The use of thermit welding is of growing importance in the nation's war effort, as is exemplified by the speedy and efficient use of this welding process in the repairing of the broken sternwheel shaft of the *Sprague*. Only because of thermit welding was it possible to return this towboat to service in record time. Aside from its ever-widening field of application in the emergency repair of heavy parts (thus alleviating the overcrowding of the nation's facilities for making large castings and forgings), thermit welding has become a desirable method of fabricating steel flanges, large frames, crank shafts, plate rolls and other heavy units for ships.

As Fighters for Freedom—

We must be qualified to vote in the coming election. Make sure that you will not lose your vote next November by seeing that you are registered NOW!

Is This the Most Critical Welding Job?

Note the great depth of the welds.

Two of the forgings from which the shaft was built up.

SMITHway Electrodes in Action . . . *sixteen forgings were welded together with SMITHway Certified Electrodes to make this 15⅜-in. diameter, 28-ft. Diesel engine crankshaft . . . one of a number produced by A. O. Smith.*

ARC welding a 15⅜"-diameter crankshaft from sixteen forgings is difficult. The welds are deep. *Good* welds are a *must,* because the shaft is subjected to terrific vibratory stresses, and because the consequences of failure are grave.

A few years ago, the job couldn't have been done. Now A. O. Smith is doing it . . . with especially developed electrodes and techniques.

We can't buy electrodes which meet our exacting requirements for this and other critical jobs. So we make our own. We *know* that these SMITHway Certified Electrodes are uniformly good, because we use 320,000 of them per day in commercial production.

We offer you the same electrodes. They've speeded work, cut costs, and licked the toughest jobs for us. Let them demonstrate that they can do the same for you.

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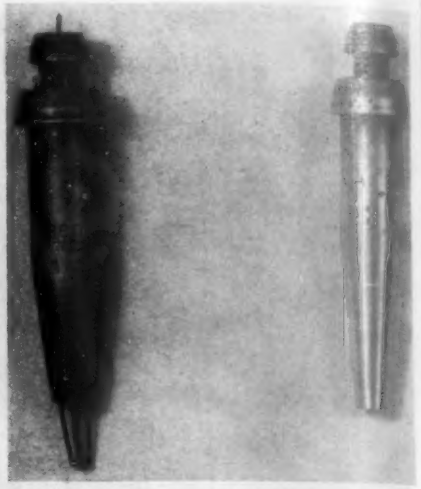
New Tips from Old

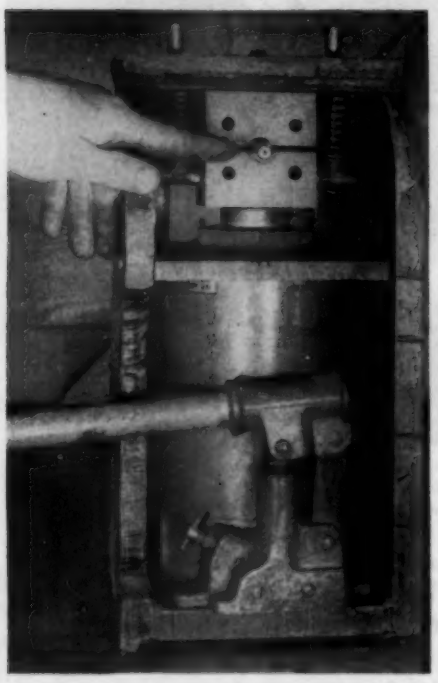
By **AL LAKE**

Director, Public Relations,
Albina Engine & Machine Works, Inc.



"Before and after" pictures of reclaimed tip. Note the piano wires which are inserted in orifices during swaging.

Damaged welding and cutting tips are being reconditioned for double and treble service by the use of specially built equipment in the tool room.



The machine consists of a 10-ton hydraulic jack mounted in an arc-welded steel box of 1 in. plate. The finger points to the tool-steel dies.

SINCE PEARL HARBOR, our shipyards and war plants have used up hundreds of cutting tips, many of which could have been reclaimed. It may be said, therefore, that thousands of dollars have been uselessly thrown away.

Torches as Hammers

Cutting tips are frequently short lived because of the inexperience of many flame-cutting operators. The fellows who are comparatively new on the job oftentimes do not use the best judgment in the handling of their tools. In particular, they subject cutting torches and tips to uses and abuses beyond their designed expectation. It is not unusual, for instance, to see a flame-cutting operator using a torch as a hammer to knock off slag or to break loose a piece of metal. The torch may be effective as a hammer, but it is usually of little value for its intended purpose afterwards.

A good point to remember (and one often overlooked by the operator) is that a cutting torch will not continue to do a good job if the end of the tip is in molten metal. There is never any reason for holding the end of the tip closer to the material than $\frac{3}{16}$ in. for any cutting job. By maintaining this minimum distance, it is possible to do a perfect job and at the same time save the tip from injury or damage. Of course, all tips will eventually pick up some slag, but this can be removed by the tip cleaner. It is much easier to clean a tip and then keep it clean than to try to restore a major portion of the tip end that has been burned away.

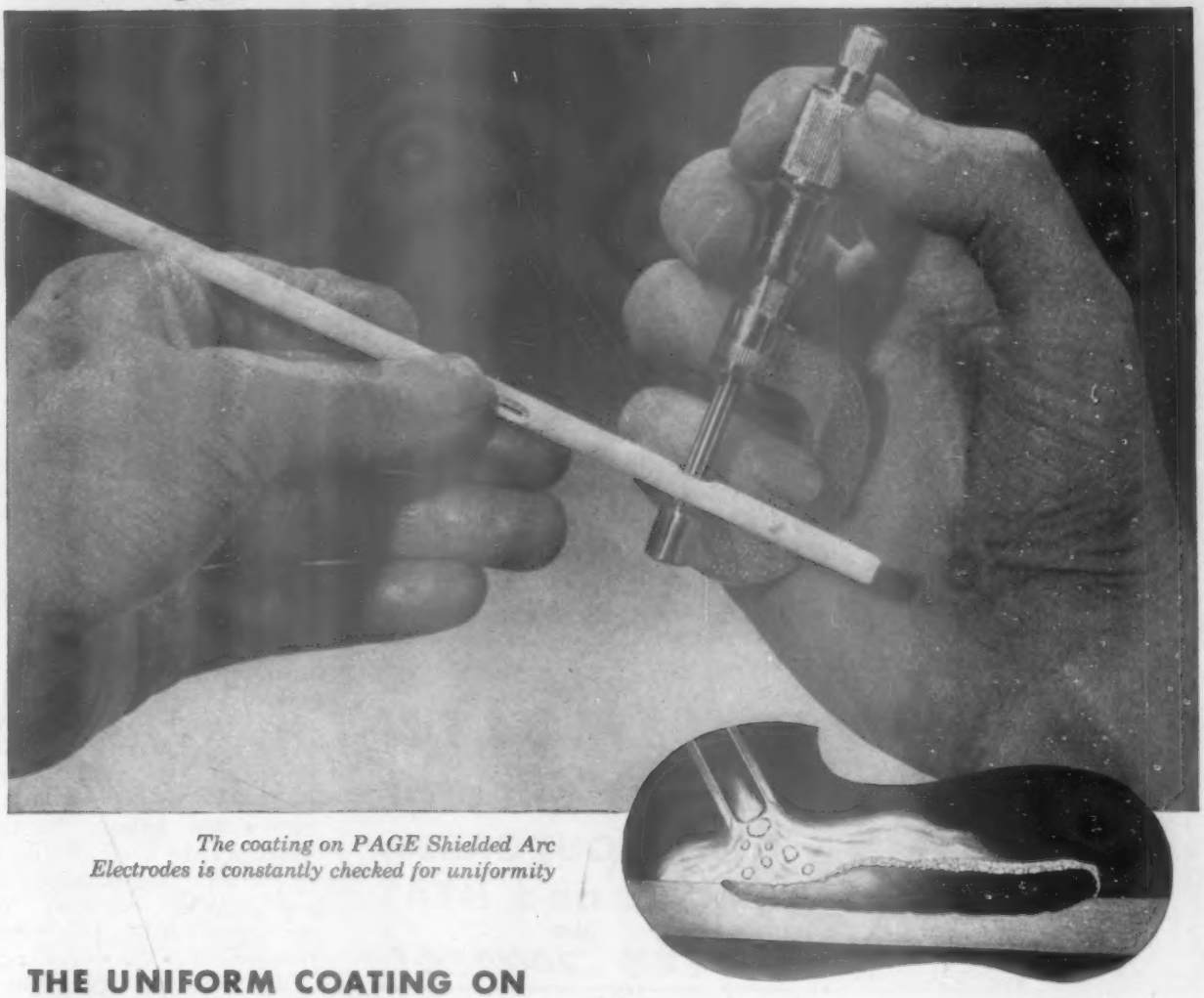
Don't Do This, Either

Another way to ruin a tip is to clean the scale off the end by rubbing it against the work. The correct method of accomplishing this cleaning task is by using a metal cloth and the correct size of tip drill. Finding these tools takes a little time so naturally many tips are ground away against steel plates by the careless worker. It all helps out Hitler.

The problem of obtaining cutting tips became so serious because of the shortage of copper and the carelessness of inexperienced flame-cut-

Ed Doran of Albina Engine and Machine Works, Inc., Portland, Ore., tests a reclaimed tip and finds that it produces a flame nearly 30 in. long. In general, tip reclamation is so satisfactory at Albina that the oldtimers actually prefer the reclaimed tips to new ones.

PAGE *Welding* ELECTRODES



The coating on PAGE Shielded Arc Electrodes is constantly checked for uniformity

THE UNIFORM COATING ON PAGE-*Allegheny* STAINLESS STEEL ELECTRODES HELPS YOU CONTROL STAINLESS WELDS

Certainly the analysis of the rod and the type of coating are vitally important in controlling stainless welds. **PAGE** went to the world's largest producer of stainless steel to make certain that **PAGE-*Allegheny* STAINLESS STEEL ELECTRODES** would be right.

But that isn't all. To meet the demands of good welding, there can be very little variation in the thickness of the coating. So, in order that you may be sure of good results, the coating on **PAGE-*Allegheny* STAINLESS STEEL ELECTRODES** is constantly checked for uniformity. **PAGE** inspection is your reassurance of uniformity in these electrodes.

HI-TENSILE "C" ELECTRODES • For vertical, overhead or horizontal welding of carbon steels, **PAGE** recommends **HI-TENSILE "C" SHIELDED ARC ELECTRODES.** These electrodes can be depended upon for welds that pass rigid tests for tensile strength, elongation, resistance to impact and fatigue. Ask your local **PAGE** distributor for specific information.

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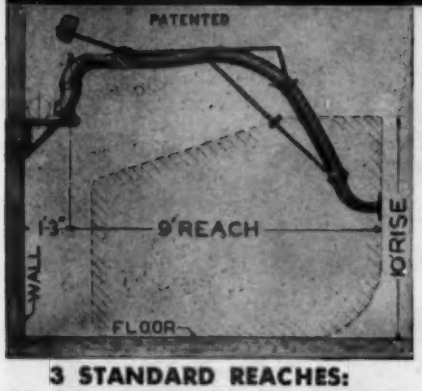

3 STANDARD REACHES:
3 ft., 9 ft. and 15 ft. radius. Arm extended for maximum reach. Note very wide working range.

RUEMELIN Fume Collector DRAWS OUT GASES, SMOKE and HEAT *at the Source!*

Solve your fume problems quickly and efficiently by installing Ruemelin Fume Collectors. Powerful suction draws out noxious gases, smoke and heat *at the source.* Guards employee health, resulting in less welder fatigue, therefore greater plant output. Has many exclusive features: (1) Clears shop air with minimum loss of building heat. (2) Exhaust snout can be positioned instantly and conveniently. (3) Covers maximum welding territory, vertically, horizontally and by circle swing. (4) Shipped completely assembled, easy to install. Thousands of Ruemelin Fume Collectors now serving war industries everywhere.

We gladly offer engineering service for your fume collector installation. Write for Bulletin 37-C.

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RUEMELIN
SAND BLAST EQUIPMENT · TUBULAR DUST FILTERS

ting operators that we at Albina Engine and Machine Works, Portland, Ore., decided to see what could be done towards reclaiming damaged tips. Cutting-tip reclamation was thus made the job of the tool room. First, we tried to solve the problem by merely squaring up the tip ends and regrinding the seats. While these comparatively simple operations did enable us to reclaim some of the tips, many of them were still thrown away. If preheating holes were oversized, the tip, even though it had been straightened, still could not be adjusted so as to do a satisfactory cutting job.

Re-swaging Tips

Finally, we hit upon the idea of re-swaging the damaged tips. The problem then became one of obtaining the proper swaging equipment. The building of this equipment offers yet another example of the American ingenuity manifested in so many war plants of recent months. The swaging machine we created will be seen in the left-column illustration, page 54.

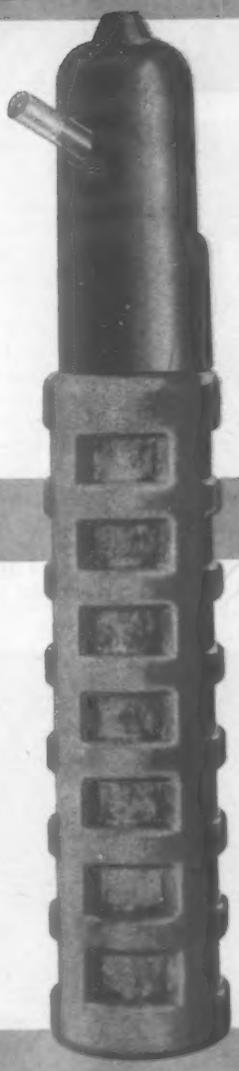
Our machine consists of a 10-ton hydraulic jack mounted in an arc-welded steel box made of 1 in. steel plate. The tool-steel dies were made in the tool room, the two halves being drawn so as to insure perfect alignment. These dies were so made that they would squeeze the tip tightly when closed. The lower die was held in the retaining boxes by means of spring-loaded rods that insured its opening when the jack pressure was released.

The swaging operation itself is comparatively simple. Piano wires of the proper diameters are first inserted in the preheating and oxygen orifices of the tip, which is then placed in the die and pressure applied. After the tip has been given a good squeeze, it is taken from the die and the piano wires removed. After the wires are pulled, the various orifices are cleaned with a tip-cleaning drill. The tip is now tested to determine the type of flame it will produce and to see if all of the preheating jets produce uniform flames. If they do not, the cleaning is repeated until the desired results are obtained.

The type of reclamation that is being accomplished in the Albina tool room is clearly illustrated in the accompanying pictures. By this simplified salvage plan, at least 98% of the damaged welding and cutting tips are reclaimed to give double or treble life at Albina. Needless to say, the plant is paying for itself. It has done so, in fact, many times over, and the results are so satisfactory that our oldtimers actually prefer reclaimed cutting tips to new ones.

TURN THE CORNER - *to Economy*

Users of arc welding realize that the hey-day of war production is past, that from here on costs must be controlled. So, in many yards and shops, the trend is to Wells new lightweight, shorter, 300 amp. Stubby model. Stubby weighs only 14 oz., is only 8¼ inches long.



1 COSTS LESS TO MAINTAIN

With a 100% enclosed, insulated handle and re-inforced, insulator cap, there is little to go wrong. Grip mechanism is fool-proof. Insulator cap gives more hours of service, is easily and quickly replaced on the job.

2 BURNS RODS SHORTER

With *Stubby*, rods can be burned right down to 1½" without damaging the cap. Positive grip makes it possible to hold rods at very tip, eliminating damage to coating. Yet stubs can be dropped with a quick quarter-turn of the cap.

3 IS MORE FLEXIBLE

Streamlined and perfectly balanced, Stubby handles much easier, especially in tight, inaccessible spots and on overhead work. Small diameter handle enables welder to hold tool easily, experience less fatigue.

4 WORKS COOLER

With a completely enclosed, 100% insulated handle, Stubby works cooler, doesn't overheat and cause hand discomfort. Tubular form eliminates sharp corners that burn quickly.

Wells' Stubby can help cut your costs now. See the Wells' distributor near you.

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Short Cuts and Kinks . . .

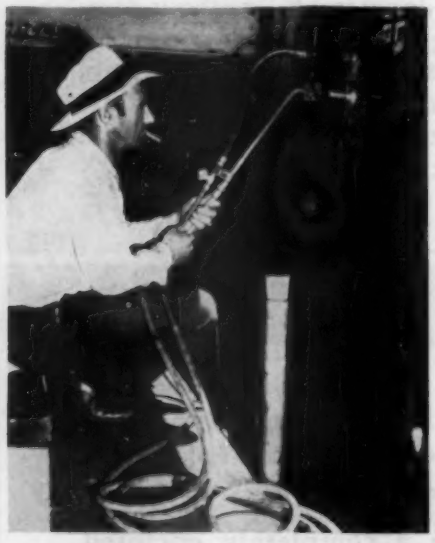
. . . *To the Cause of Victory*

A few of the many time and labor-saving ideas developed by tacticians of the production line are presented every month in this department. If you have a good welding idea of your own to pass along, you are hereby invited to contribute it to the cause of victory. Send anything you think suitable to: Short Cuts and Kinks, THE WELDING ENGINEER, 506 S. Wabash Ave., Chicago 5.

One-Man Flame-Shrinking

By Joe Lovasco
Consolidated Steel Corp., Ltd.

Two men are usually required for flame-shrinking, one man to do the heating while the other does the quenching. This seemed to be a needless waste of man-power so I designed a heating torch which incorporates a quenching spray. I suggested its use to our joint Labor-Management Committee, which accepted the idea.



Only one man and this combination heating-and quenching torch are needed for flame-shrinking.

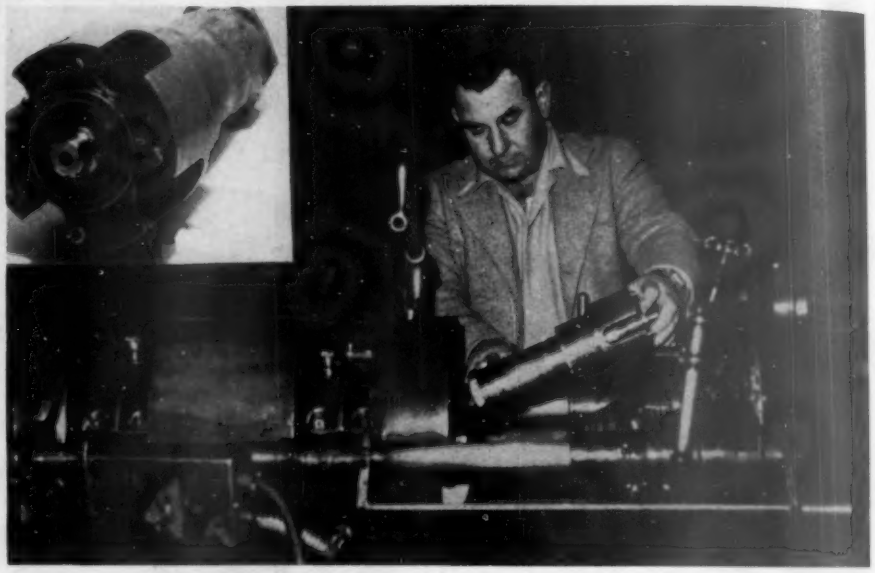
This comparatively simple device involved an outlay of less than $10 to make, yet it resulted in a saving of over 700 man-hours per CI-B cargo vessel.

» «

Pipe-Scarfing Machine

By H. L. Maher
California Shipbuilding Corp.

A FIXTURE for scarfing pipe which I suggested to our local Labor-Management Committee brought me an Honorable Mention in the War Production Drive. The tool is chucked in a pipe machine, but it can also be made into an independent machine, under its own power, to salvage short lengths of pipe for welding. It cuts a neat, uniform bevel.



This tool bevels three sizes of pipe for welding. It has increased production approximately five times over the previous method.

The tool rotates and has four cutting edges inside. It bevels three sizes of pipe with an automatic setting, scarfing the pipe after it has been bent and cut to length for welding. The pipe machine rotates the tool while the pipe is held stationary in special pipe jaws in the steady rest. The steady rest is used to feed the pipe into the scarfing tool.

Five times the production and double the safety factor have resulted from the adoption of this tool to prepare pipe for welding.

Bulkhead Jack Pads

By P. J. Pickering
California Shipbuilding Corp.

IT was our common practice to weld jack pads to each bulkhead to facilitate the lowering of the bulkhead into place. Such welding, naturally, involved weldors' time and welding materials. When the operation had been completed, the pads had to be removed by flame-cutting or by chipping. This required additional hours of labor. Also the pad itself was often damaged, and it could be re-used but very few times.

I submitted a suggestion to the Labor-Management Committee for a new type of jack pad—one that could be easily disengaged by removal of a wedge and could be used indefinitely. These particular pads are now made in three sizes to fit the stiffeners on all sizes of bulkheads. The adoption of this suggestion has saved many man-hours and it has also conserved considerable material.

This jack pad is easily and quickly attached by means of wedges. It provides a solid surface for operation of the jack, and it can be used indefinitely.

All over the Home Front

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P&H HARMOMANG

A Proved Electrode For *high* Resistance to Impact, Abrasion and Wear

Harmomang is an electrode with the work-hardening qualities which suit it especially for the building up or hard surfacing of manganese and carbon steels.

It is a coated moly-manganese electrode with a hardness range up to 43-46 Rockwell "C". It can be used on AC, or for either straight or reverse polarity on DC.

Harmomang is the ideal electrode to use wherever you need protection against both impact and abrasion. For example: for hard surfacing dipper lips, dipper teeth, bucket runners, rock crushers, railway frogs or wherever longer life is desired for parts made of manganese or carbon steels.

Write direct for full information and procedures or see your P&H representative.

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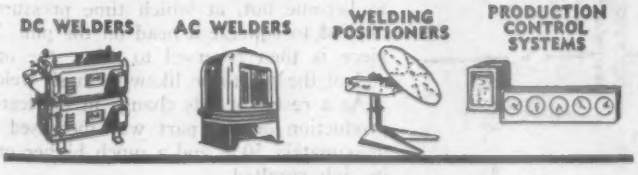

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Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.

Continuous contact for submerged-melt welding is assured by this spring-tension rod feed jaw.

Submerged-Melt Head

By William Spielman
Consolidated Steel Corp., Ltd.

IN SUBMERGED-MELT welding, the rod feed jaw ordinarily depends upon the pressure and angle of the wire entering the head to make a contact. Since the contact is not always perfect, there are sometimes voltage fluctuations with resultant rough welds.

To eliminate this difficulty, I devised a new spring-tension rod feed jaw which makes a constant contact on the wire feeding into the jaw. This idea was submitted to and adopted by the Labor-Management Committee at Consolidated Steel.

The spring in the jaw head keeps a constant pressure on the wire, eliminating sparking or arcing within the head. It also prevents the jaw from becoming corroded and having a rough contact surface. Performance efficiency is increased and continuous contact is maintained. This device results in a reduced operating air pressure. Since it gives constant voltage without fluctuation, the overheating of the rod is prevented, resulting in a smoother weld deposit.

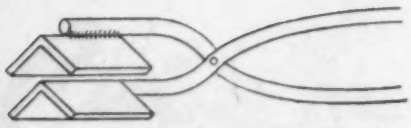
The manufacturer has adopted the idea as an original equipment feature for all future machines with this type of submerged-melt welding head.

» «

Small Welding Jig

By Alton P. Kemp

I MADE a very handy welding jig from two pieces of angle iron and use it for welding in a shipyard sheet metal shop. The angles were first filed out square so they would rest securely together and were then welded to a pair of pliers to replace the regular jaws. (This is an even better tool if you use vise-grip pliers.) The jig will hold any right angle sheet-metal joint, lapping either way for the first couple of tacks. If the pliers must accommodate different gauges, don't make both of the jaws solid but mount one on a pin so it can rock to fit.



Courtesy, The Lincoln Electric Co.

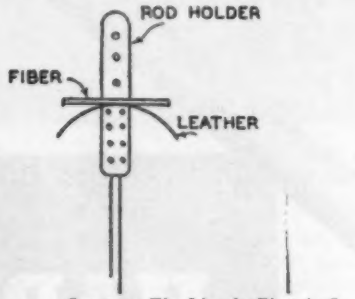
The angles are welded to pliers to hold small weldments.

» «

Hand Protector

By Michael J. Miglets

THIS idea is not my own but one that is used by many weldors in shipyards to prevent burning their gloves or hands while doing overhead welding. You take a square piece of leather about 6 in. on a side and cut out a hole in the center in which you can slide the handle of your electrode holder. Let the square piece of leather overlap your gloves as shown in the sketch.



Courtesy, The Lincoln Electric Co.

An idea that saves hands and gloves on overhead welding.

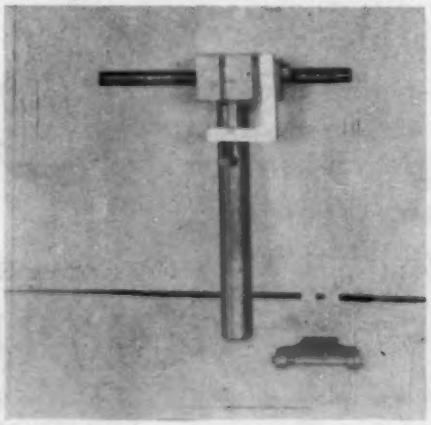
» «

Mash Welding Pins

By Daniel E. Estep
International Harvester Co.

IT WAS general practice at our Springfield, Ohio, plant to peen by lightly tapping with a hammer the ends of pins used in the assembly of ammunition chest strap retainers. The pins could not be struck hard or upset in any kind of riveting machine because of their small diameter and extremely long unsupported length.

The pin is mash welded to the part on a pedestal-type resistance welder.



I designed a special resistance-welding electrode which made it possible to upset the pins by mash welding. This idea was accepted by the Labor-Management Committee.

The retainer part and pin are now placed on a special welding electrode point on a pedestal-type resistance welder. The welding current causes the upper end of the pin to become hot, at which time pressure is applied to squeeze a head on the pin. The piece is then reversed to allow the other end of the pin to be likewise mash welded.

As a result of this change in fabrication, production on the part was increased approximately 50% and a much higher quality job resulted.

Tester for electrical equipment and motors. It can be carried to any part of the yard where there is welding machine trouble.

Welder Tester

By Walter Donahue
Consolidated Steel Corp., Ltd.

IN CHECKING a welding machine, repairmen are often unable to determine the fault because they have only the weldor's word or their own superficial observation to rely upon. Or perhaps several things may be wrong with the machine, and only the obvious one of them fixed.

To eliminate all this guess work, I suggested a portable tester to the Labor-Management Committee. This can be carried to any part of the yard where there is electrical trouble with welding machines. It can be applied to any type of equipment, and it tests for resistance, continuity, volts up to 800 (a-c and d-c) and amperes up to 300.

The tester cost approximately $5 to build, and it has saved us approximately 120 man-hours per hull.

B-29 SUPER-FORTRESS GETS READY FOR TAKE-OFF (Photo Courtesy Bell Aircraft Corporation.)

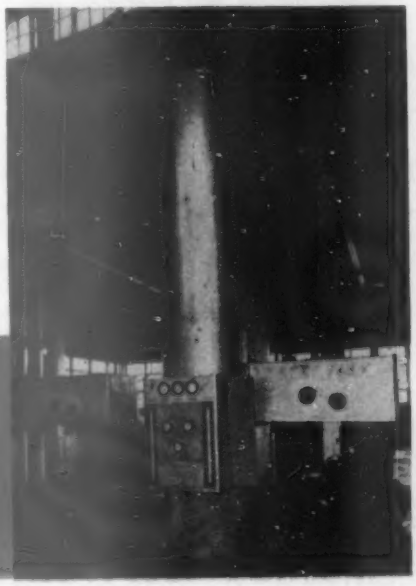
HITTING THE HIGH ROAD TO VICTORY

OXYGEN-equipped B-29 Super-Fortresses, largest fighting planes the world has ever known, already are smashing at the very heart of the Japanese homeland. These bombing raids and the thousands made against Europe and other enemy-held lands by Liberators, Flying Fortresses and high-flying fighters can be undertaken only with the use of oxygen, which means life itself in the upper reaches of the sky.

Many of these planes roaring over the high road to victory receive their vital supplies of oxygen from *Air Products* mobile generators scattered around the globe. *Air Products* today is concentrating all its production efforts on mobile oxygen generators and stationary plants to help win the war. When victory comes, the company will resume construction for industry of modern, efficient plants using the air liquefaction process for the production of oxygen, nitrogen and other gases contained in the air.

Air Products INCORPORATED

MANUFACTURERS ROAD, CHATTANOOGA 1, TENN.

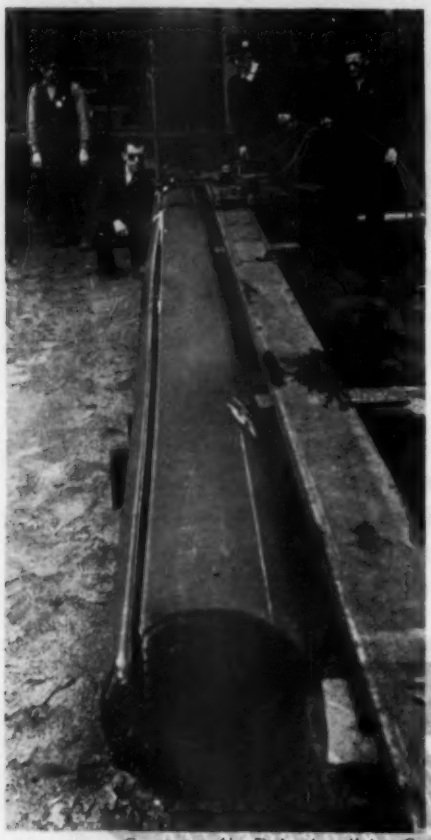


Above: Trailer Model of Mobile Oxygen Generator *Right:* Stationary Oxygen Generator

On the Job

Circle Squaring

"SQUARING THE CIRCLE" is a mathematical impossibility only when the solution is limited to straightedge-and-compass construction. When gas-cutting machines



Courtesy, Air Reduction Sales Co.

Much like a log is squared at the sawmill, this discarded shaft is being flame-cut into a square cross-section by a traveling cutting machine. The shaft is turned 90 deg after each cut to position it for the next longitudinal slice.

are introduced, the old circle-squaring dilemma is no more difficult than to saw up logs in a sawmill.

A Canadian shipbuilder ran up against this problem when he could not obtain suitable blanks—square slabs of steel—for the cable clinches and blake stoppers of the corvettes he was building. The time required to get the necessary blanks from the mill would have seriously delayed delivery of these badly needed naval vessels . . . but luckily someone remembered that there was a 20 ft length of 15 in. steel shafting on the scrap pile.

The big shaft was carried into the shop and cut down with a portable motor-driven flame-cutting machine into a square cross-section of the size required for the blanks. Four cuts were made, the shaft being turned 90 deg after each cut. The four rounded sections were, of course, sent back to the scrap pile. The resulting square bar was sliced transversely into sections of the desired thickness. The cable clinches and blake stoppers were then shape-cut from the resulting blanks on a pantograph-type flame-cutting machine mounted on a tracing table.

Results: the parts were fabricated and the corvettes delivered on time—thanks to ingenuity and modern flame-cutting methods.

» «

Seam-Welded-Pipe Mills

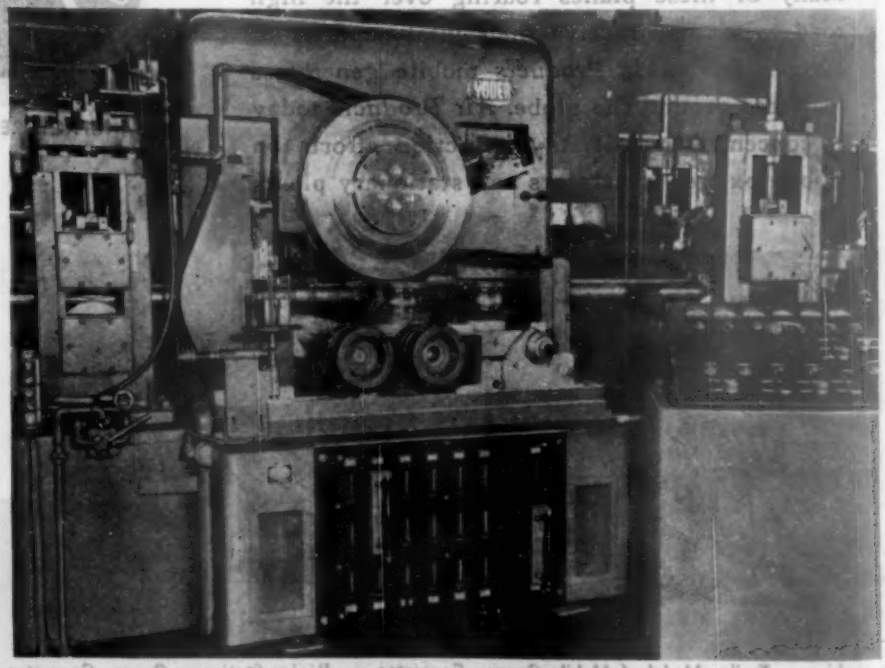
Two complete mills for the production of 1½ to 6 in. resistance-welded steel pipe were built recently for Russia by The Yoder Co. of Cleveland. The mills are identical twins. The first has already been viewed, torn down and shipped; the second is now being assembled. Each mill makes a production unit about a quarter of a mile long.

Heart of each big pipe-making machine is a 750 kva a-c welder (see accompanying illustration), which has an ingeniously mounted electrode-and-transformer assembly. The electrode wheels are mounted directly to the transformer, which revolves with them so that an unusually short travel of welding current is achieved. The welder is equipped with a voltage regulator, a dressing tool for shaping its electrodes and flash-removing tools. It is compactly assembled and provides for convenient adaptation to the various pipe sizes within the range of the mill.

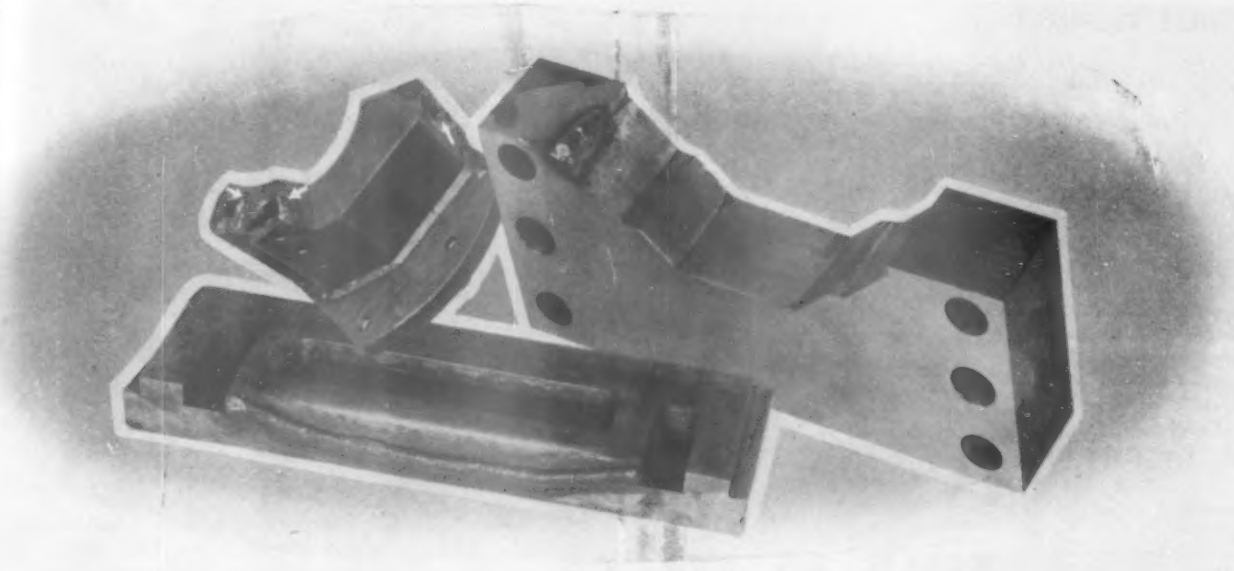
In operation, the coils of heavy sheet steel are uncoiled and fed to the mill. Power-driven uncoiling rolls and pinch-rolls pass the strip to the leveler, which takes out the unevenness. The side trimmer, the next unit, goes into action when mill-edge stock is used. Adjustable rotary cutters trim the stock to the exact width required for the size of pipe in production. (A "lawn mower" type of chopper reduces the trimmed scrap to a form convenient for disposal.) The hot-rolled unpickled stock is then prepared for welding by shot blasting strips about 1½ in. wide on both sides of each edge.

The tube-forming mill, largest unit in the set-up, is an eleven-stand mill of the conventional roll-forming type. The open-seam tube comes from the forming mill with the blasted edges in precise alignment for welding.

Welding is automatically and continuously performed on the 750 kva welder previously described. A driven pullout pinch-roll stand propels the tube from the welder into a cooling trough. Here a carefully controlled coolant reduces the temperature of the freshly welded tube sufficiently to permit its passage into a three-roll mill for sizing and straightening. After the endless tube has been prepared to satisfactory roundness, it is automatically cut "on the run" by a flying rotary cut-off. This hydraulically controlled machine can be used with either disc or parting type cutters, and it is adjustable to pipe size.



Part of a quarter-mile-long mill for the production of welded steel pipe in Russia is this 750 kva seam-welding unit. On the main control panel (right foreground) is centered a system of indicators, rheostats and controls to bring full and flexible mastery of the mill under one man's fingers.



Welds That Save Fifty Times Their Cost

When one welding dollar saves a fifty dollar investment from the scrap pile —that's profitable welding—and just a conservative example of what welders are doing on "hard-to-weld" metals with PHILLIPS CRUCIBLE ARC Electrodes.

Hundreds of shops are arc welding those hard-to-weld metals and alloys as easily as they would weld mild steel. They've been doing it for years. It isn't hard—it's just a matter of "knowing how" and using the right material.

More than 120 different welding materials are regularly stocked by C. E. Phillips & Company—a rod for every weldable metal and alloy. For more than 20 years our engineering staff has been accumulating data on specialty welding problems. You will find it profitable to draw upon this experience.

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Tells how to select electrode material for various job requirements, and gives full details of procedures to use for best results with each material.

Arc Welding in the Maintenance and Construction of Tools and Dies

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MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

Welded Tractor-Trailer

By Fred Reynolds

REYNOLDS BROTHERS, Sturgeon Bay, Wisc., has for several years hauled a 7½ ton tractor with dozer attachment on a large semitrailer flat rack whenever work was to be carried on at a distance. The tractor was mean and dangerous to load with planks and blocking. Last winter one of the drivers dumped it off the trailer, and it took a wrecking crew half a day to untangle the wreckage. Right then we decided to build a trailer suited to its freight—one that could be made in our own shop by means of arc welding.

After dreaming a few nights and looking around during the day, we located an old dump truck with a good heavy frame. We bought it for $30, added two heavy rear ends, two old motors, various thicknesses of plate and started to build an 8 by 25 ft (overall) trailer.

Courtesy, The Hobart Brothers Co.

This welded tractor-carrier was built by two men in three weeks at an approximate cost of $600.

The underslung bed was made 8 by 14 ft with a ground clearance of 10 in. The frames were made of rectangular tubes instead of channels. The four main beams were 3 by 7 in. tubes, and the cross frames were 2½ by 6 in. tubes alternating with 2½ by 6 in. tees made from plate.

The goose neck to get the rise to the fifth wheel was made of two arched tubes 8 by 4 in. by 8 ft and was gusseted throughout to keep it from buckling. Whenever strength was doubted, $\frac{7}{16}$ in. fish plates were added and concealed in tubes and arches. The various plates used were ¼, $\frac{5}{16}$, $\frac{3}{8}$ and in a few places $\frac{7}{16}$ in. Deck plates were made by spotting floor plate design on common smooth plates with $\frac{3}{16}$ in. electrodes.

The fifth wheel pin was made on our own lathe out of a 4 in. drill jaw and welded into the frame of the tractor with gussets. All welding on the trailer was positioned by means of a revolving frame.

The trailer was completed in three weeks with one weldor and a helper. It weighs 5,945 lb, and its approximate cost was $600. Though built to haul only eight tons, it has been used to haul 15 tons (two tractors loaded crosswise).

Where it formerly required two men at least two hours to load the tractor, haul it five miles, unload it, reload and return, the same can now be accomplished in one hour with only one man. We don't even travel the tractor as short a distance as one mile because it's so easy to load and haul.

THIS IS IT!

— CHEK-SHOCK Oxygen CUSHION Valve —

- **Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.**
- **Will prevent unnecessary internal wear in regulator *(as, NOT necessary to release control screw before opening tank valve).***
- **Will eliminate possible injury to operator from burstings.**
- **Will increase life of regulator assembly.**

This NEW automatic safety device CUSHIONS the initial BLAST of pressure when tank valve is turned on *(this uncontrolled surge which strikes like a hammer, is the direct cause of most damaged regulators and accidents.)* Thereafter pressure slowly equalizes and then CHEK-SHOCK allows a full flow of oxygen.

ONLY ONE MOVING PART, POSITIVELY FOOLPROOF

PRICE IS LESS THAN ONE REPAIR BILL

Coupler type (will fit any std. size welding type oxygen regulator)	$6.00 ea.
Type "A" (for small Airplane or Soldering type regulators)	6.00 ea.
Also made for all types of couplings to fit *MEDICAL* regulators	7.00 ea.

See your distributor or write—

Safety Shock Manufacturing Co.
FOWLER, CALIFORNIA

Idea Factory

THE "idea factory" of Marinship Corp., Sausalito, Calif., is said to lead all industrial plants in the nation for the number of production shorts cuts proposed by workers and accepted for national recognition by the War Production Drive.

"Workers' ideas have saved us $1,240,000 in man-hour costs and $75,000 in material," said W. E. Waste, general manager of the shipyard. "Out of 120 prize-award suggestions adopted for use, 107 are still standard practice, while the 13 abandoned have in most cases been supplanted by better methods."

TOP-FLIGHT WELDS ON LOW-ALLOY STEELS

RACO 74 · RACO 64

SHIELDED-ARC ELECTRODES

WHEN you are making all-position welds on low-alloy high-tensile-strength steels such as Corten, Yoloy, Cromansil, Silten and Carbon-Moly Steels, use RACO 74 Shielded-Arc Electrodes . . . for flat- and positioned-fillet welds on these Steels use its companion electrode, RACO 64.

It is only natural that RACO 74 and RACO 64 should give exceptionally good results because, as with all RACO products, these electrodes are manufactured under the most modern conditions: . . . finest quality materials . . . precision equipment . . . constant laboratory tests.

We shall be glad to send samples so that you may know, without cost, how well you will profit by using RACO 74 and RACO 64 henceforth.

CONFORM TO THE FOLLOWING SPECIFICATIONS:

RACO 74 Electrodes conform to the following specifications: A.W.S.-A.S.T.M. Specification A233-42T, Type E-7010; U. S. Navy Specifications 46E2 (INT) Class 1.

RACO 64 Electrodes meet the requirements of the following specifications: A.W.S.-A.S.T.M. Specification A233-42T, Types E-7020 and E-7030, U. S. Navy Specification 46E2 (INT) Class 2.

The REID-AVERY COMPANY

DUNDALK BALTIMORE 22 MARYLAND

SINCE 1919 · PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

Conservation Welding Has Special Value in Wartime...

Present metal shortages were not anticipated when Amsco Welding Products were developed for the hard-facing, reclamation and repair of equipment wearing parts; and from an economical standpoint alone, these measures justified themselves in peace time.

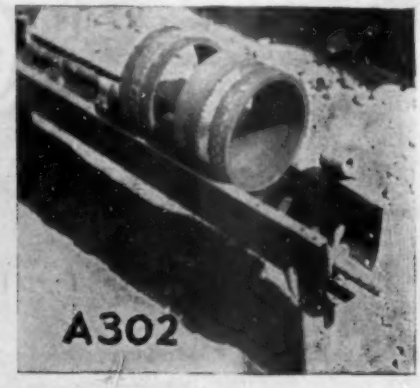
War conditions have magnified the value of Amsco Conservation Welding. With replacement parts difficult—and sometimes impossible—to procure, more equipment operators have found that the hard-facing of new parts is an important preventive of production delays. They have also learned that worn parts rebuilt with Amsco materials, and then hard-faced, frequently give a longer second life. Having the part out of service for a few hours is preferable to waiting weeks or months for a new part.

A few examples of Amsco Conservation Welding are pictured.

Write for Bulletin 941-W on Amsco Welding Products.

A-214—Dull, inefficient dipper teeth are made sharp and effective at small cost with an Amsco Repointer Bar and a little Amsco Nickel Manganese Steel Welding Rod.

W-103-B—These two tractor sprockets were put into service at the same time. The one on the left had been rebuilt with Economy Hardface, while the other was brand new. The new one is worn to such an extent that it is necessary to resurface it with Economy Hardface, while the welded sprocket needs no repairs.



A-302—Anvil Rolls used in the production of composition roofing quickly become worn from the abrasive material and the cutting knives. This customer formerly used tool steel anvil rolls, but now uses carbon steel rolls, with Amsco Dieweld applied to the portion subjected to extreme abrasion. Deposits are shown before and after grinding.

262—This conveyor screw handling hot clinker was hard-faced on the wearing edges with Amsco No. 217 heat and abrasion resistant rod, resulting in greatly increased service life.

Amsco

AMERICAN MANGANESE STEEL DIVISION

Chicago Heights, Illinois

FOUNDRIES AT CHICAGO HEIGHTS, ILL., NEW CASTLE, DEL., DENVER, COLO., OAKLAND, CALIF., LOS ANGELES, CALIF., ST. LOUIS, MO.

OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

Move Giant Stack

ONE of the most unusual feats in motor transport history was the removal of a 20-ton welded smokestack from Allentown, Pa., to the Philadelphia navy yard, a journey of 60 miles. Measuring 24 ft wide and 18 ft high in carrying position, this gigantic piece of equipment was so large that entire trees had to be cut down, branches of other trees cleared and telephone and electric wires raised or disconnected to permit its passage.

Courtesy, The White Motor Co.

Passing through the Philadelphia suburb of Roxborough, this giant welded smokestack is close to its destination, the Philadelphia navy yard.

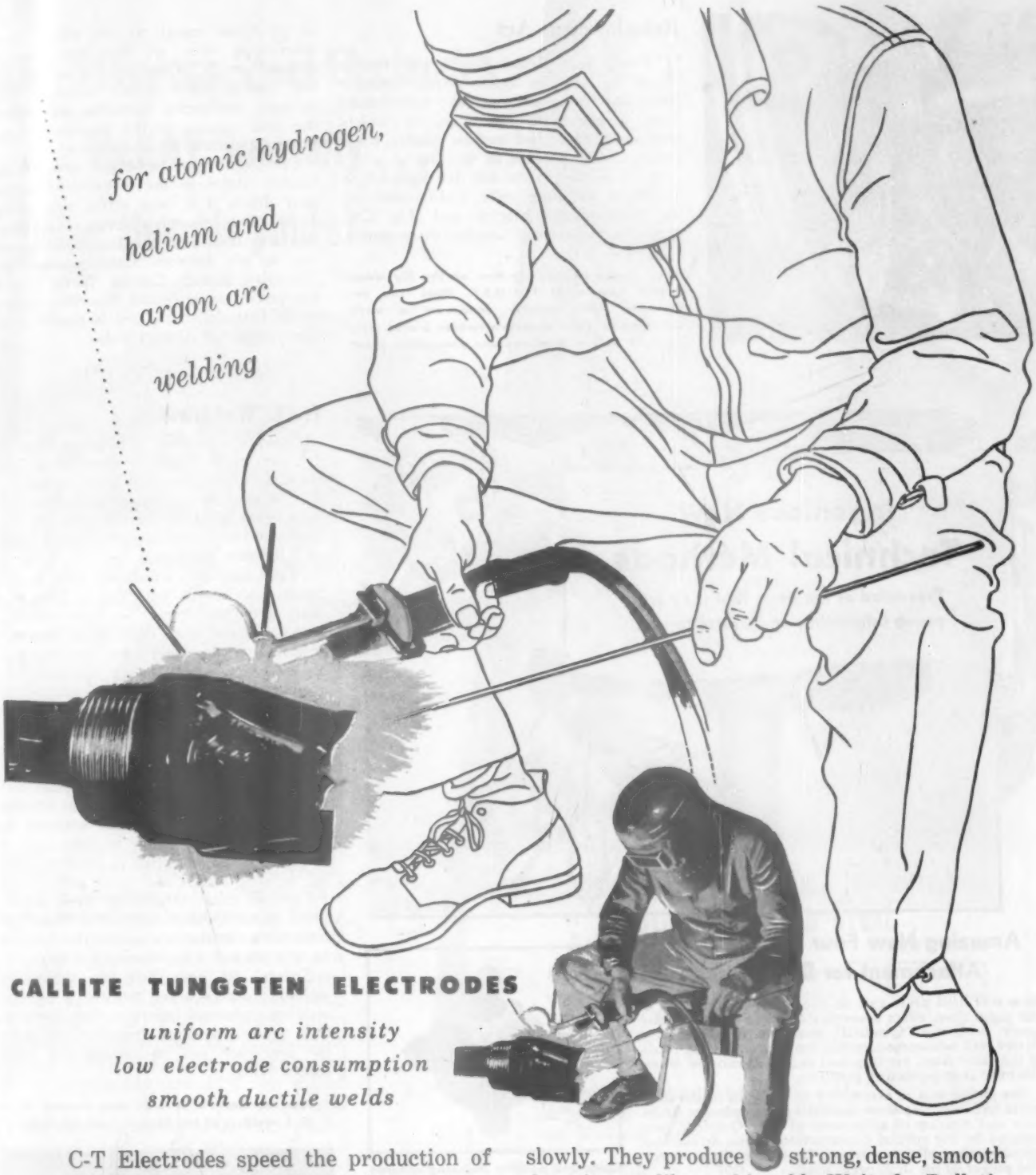
The stack was transported by J. H. Beers, heavy hauling expert of Bangor, Pa., using a White tractor and a drop-frame trailer. It was accompanied on its journey by crews from the Bell Telephone Co., the Philadelphia Electric Co., the Philadelphia Transit Co. and members of state and local police. An inspector and six police were necessary to guard the unit and to prevent accidents as the entourage moved through Philadelphia traffic.

» «

Welded Placque

A STAINLESS STEEL placque with welded lettering was presented by refinery workers of the Standard Oil Co. (Ohio) to commemorate the dedication of the "Sohio Catalytic Cracker." Stanley Guzik, the weldor who did the lettering, and Otto Glomb, boilermaker foreman, made the presentation during the dedication exercises of the company's new 100-octane aviation gasoline plant on the site where John D. Rockefeller established the original Standard oil refinery 75 years ago.

W. T. Holliday, president of the Standard Oil Co. (Ohio) is shown inspecting the welded stainless steel placque presented by refinery workers.



CALLITE TUNGSTEN ELECTRODES

uniform arc intensity
low electrode consumption
smooth ductile welds

C-T Electrodes speed the production of Curtiss-Wright propeller blades, struts or shock absorbers for tanks. The Hughes Tool Company uses C-T Tungsten Electrodes in applying tungsten carbide hard facing to their Soft Formation Core Bit Cutter Head.

Of 99% pure tungsten, Callite Electrodes retain their stiffness, keep the arc properly spaced and are consumed slowly. They produce strong, dense, smooth deposits, readily machineable. Write for Bulletin No. 154. Callite Tungsten Corporation, 549 Thirty-ninth Street, Union City, New Jersey. Branch Offices: Chicago, Cleveland.

R_x for R DAY When reconversion time comes, the Atomic Hydrogen process with C-T Electrodes offers a quick method of altering dies and molds to accommodate design changes. Discuss your plans with our engineers. Our accumulated knowledge and experience are worth having.

Callite CALLITE TUNGSTEN CORPORATION CT **TUNGSTEN ELECTRODES**

Standard or special-polished, clean and black. Seven standard diameters, 12 inch lengths. Other random lengths and unusual diameters on special order.

PIONEERS IN TUNGSTEN METALLURGY OVER TWENTY-FIVE YEARS

Rebalancing Act

THE U. S. S. *Maui*, 27-year-old veteran of the seas, is again plying between American bases and overseas battlefronts after a successful operation in which previously untouched turbine blades were replaced with the aid of welding.

In the picture to the left, Joe Spincich, a weldor at the Emeryville, Calif., plant of the Westinghouse Electric and Mfg. Co., is applying a precisely weighed three ounces of electrode metal to an exactly predetermined spot on the high-pressure-turbine spindle in order to bring the six-ton spindle into perfect balance. This delicate rebalancing operation was one of the final stages in the overhaul of the liner's main propulsion turbines.

The *Maui*, first passenger vessel in the United States to use a turbine-reduction gear drive, is a twin screw ship having 10,000 shaft-hp and a speed of 16 knots. She was built for the Matson Navigation Co. to ply between California and the Hawaiian Islands. During World War I she carried supplies and American soldiers to the battlefront, and she is rendering the same important service today.

Three ounces balance six tons on the big steam turbine spindle of the U.S.S. Maui. The ex-Hawaiian liner recently underwent a major operation in which defective turbine blades were replaced at the Westinghouse Emeryville plant.

» «

Amazing New Four Spindle Turret Attachment for Drill Press!

Now one drill press can do the work of four and, at the same time, effect a savings of up to 75% in floor space, with the "Quadrill" attachment. This rotary device will accommodate four boring or cutting tools at the same time, yet one tool *only* is in motion when the head is in operating position.

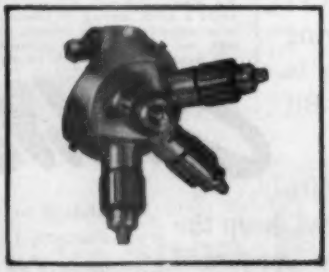
The entire unit is assembled to the quill of the drill press and is driven from the drill press spindle. Accuracy and rigidity of alignment of the "Quadrill" are assured by the special construction of the driver and spindles, thus efficiency is only limited by the accuracy and power of the drill press itself.

Foolproofing **in indexing is accomplished by visual markings and by the relationship of the index pointers on the index disc, as well as the extension of the spring retainer. Four hardened and ground spindles are fitted for No. 32 Jacobs chucks or their equivalent. To provide correct positioning at all times, the entire spindle assembly is located by means of an accurate fitting of recess and undercut, between turret and bearing housings. The hardened friction starter and driver have been so constructed that at any speed proper synchronization of the driver teeth is accomplished without clashing.**

It goes without saying that our fighting men must have the finest possible quality materials home industry can produce. So, although the stock of quality raw materials from which Wrigley's Spearmint chewing gum is made is growing steadily smaller, they are still maintaining pre-war standards. However, they can now make only a portion of their former output, so all of this limited production is going to our fighting men and women overseas only . . . where it is an "on-duty" need.

You can get complete information from Chicago Drillet Corporation, 919 N. Michigan Ave., Chicago 11, Ill.

Quick and positive indexing assured by pointers on index disc



Quadrill assembly complete ready for attachment to drill press

Y-140

G. I. Weldors

AMERICAN soldiers are using their ingenuity to "make it work" even when they can't get the right part, material or tool for the job. As an example, War Correspondent Fred B. Barton cites the time that tow-bars were needed to draw B-24's or Liberator bombers.

"Tow-bars are available back in the States," writes Barton, "but in India they don't grow on trees. So these lads improvised some from light India steel furnished by reverse lend-lease. Welding gave the bars their necessary strength and rigidity. The job was done quickly and done without loading down cargo planes from the States with heavy goods."

The 29 G. I. weldors in the depot's welding shop are constantly being asked to manufacture articles which any plant back home would go and buy outside as a matter of course. A partial list of some of the things they have made includes: an oil drum rack, an oil filter to reclaim refuse oil, welding stands and carts, wing dolls for a C-46, charcoal-burning stoves, a drill-press stand, a vulcanizing table, frame and table for a circular saw, an overhead trolley on a truck and a boom on a tractor.

Several of these men are experienced weldors; others never touched a piece of welding equipment before in their lives, but they are all working together and doing the important job of keeping our India planes flying.

This tow-bar for a B-24 was devised by G. I. weldors at the Central India air depot.

Official U. S. Army Air Force Photo. Courtesy of The Lincoln Electric Co.

Making Stainless Steel Electrodes is a McKAY Specialty . . .

Using them is yours!

Here is a Helpful Booklet About *Welding Stainless Steel*

McKay Stainless Steel Welding Electrodes are "tops" in quality. There are good reasons for this leadership.

Among these are the standard McKay practices of: (a) Continued research in the Mellon Institute at Pittsburgh, Pa., as well as in our own laboratory at York, Pa.; (b) Analyses and correct selection, before coating, of *all* core wires; (c) use of *either* Titania or Lime Coating as preferred by you . . . not just one coating for all grades; (d) Every "batch" pilot tested before production; (e) production runs crack tested, pad analyzed, weld metal analyzed, physically tested . . . or all of these if necessary . . . to *prove* quality; (f) Exact analysis stamped on each package and certified upon request. These precautions, plus most modern production facilities, assure you of complete uniformity and successful performance.

You can weld better with these better electrodes! To test your knowledge of practical stainless steel metallurgy, ask for your free copy of the new booklet, "Things to Know About Welding Stainless Steels."

TRY YOUR HAND AT THESE QUESTIONS ABOUT STAINLESS STEEL

		TRUE	FALSE
7.	Stainless Electrodes which are to be used for welding Stainless Vessels subject to Corrosive action, must be stabilized to prevent Carbide precipitation.	☐	☐
8.	Carbide precipitation does not affect the heat resisting properties of Stainless Steel.	☐	☐
9.	Molybdenum is added to Stainless Steels to increase their sealing resistance at elevated temperatures.	☐	☐
10.	Not all Stainless Steels are classified by metallurgists as "Austenitic."	☐	☐

ANSWERS: 7. False 8. True 9. False 10. True.

GENERAL SALES OFFICES: YORK, PA.

THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

New Products to Use

Flame-Priming Nozzles

★ The new Victor descaling nozzle for the removal of rust scales from steel plate to prepare it for painting is made in 4 in. (Model 361) and 6 in. (Model 362) flame

Victor flame-priming (descaling) nozzle to prepare steel surfaces for painting.

widths and can be easily attached to any standard welding torch butt of this manufacture. It can also be furnished with torch butt.

The nozzle is provided with a spiral mixer and gas proportioner to handle the larger gas volumes required for the operations of flame-priming and descaling. This mixing device is said to assure freedom from backfire or flashback. An "Airadiator" aluminum cooling section is incorporated at the nozzle head in order to keep the premixed gases below ignition temperatures. Meehanite skid shoes with lugs allow the nozzle to be dragged at any suitable angle over the metal surfaces to be cleaned. Skid shoes are replaceable, adding substantially to the wearing life of the nozzle.

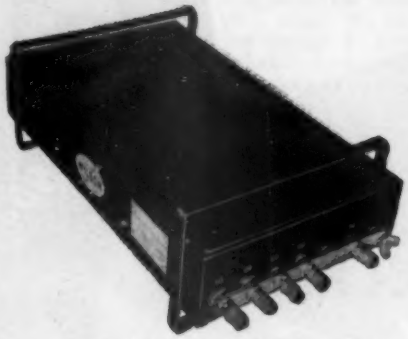
Special circular multiflame nozzles are available for inaccessible areas or rivet heads. **Victor Equipment Co.**, 844-54 Folsom St., San Francisco 7.

» «

Tack-Welding Control Panel

★ The "Wilson Type 30" is an improved circuit-control panel for tack welding with a constant potential power supply. The current values are controlled by specially designed contacts and are adjusted by turning fiber handles tight against a copper bus bar to connect the various resistors (round Nichrome wire mounted on insulators) into the circuit. The output current is the sum of the resistors so connected. The resistors are disconnected by turning the handles in the opposite direction and locking them in position.

These panels are available in 150 and 230 amp sizes. The former has taps for 10, 20, 40 and 80 amp; the latter taps for 10, 20, 40, 80 and 80 amp. On both units, current adjustment is possible in 10 amp steps. The panel is designed so that the calibration figures are correct when connection is made to a 65 volt generator with 25 volts arc and 5 volts drop in the welding head. The drop in the panel is 35 volts at rated current values.



"Wilson Type 30" special tack-welding circuit control panel.

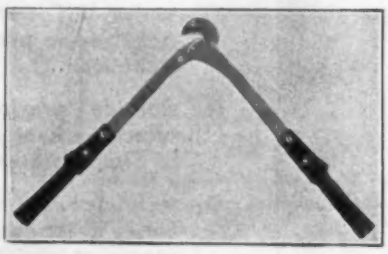
A bulletin giving technical data on this product may be obtained from **Air Reduction Sales Co.**, 60 E. 42nd St., New York City 17.

» «

Stainless Steel Electrode

★ A new stainless-steel electrode developed by **Alloy Rods Co.**, York, Pa., is said to be able to serve for either a-c or d-c welding, on every stainless analysis and in either flat, vertical or overhead positions. This electrode has a low spatter loss, produces easily removed slag and establishes the arc instantly, states manufacturer.

» «



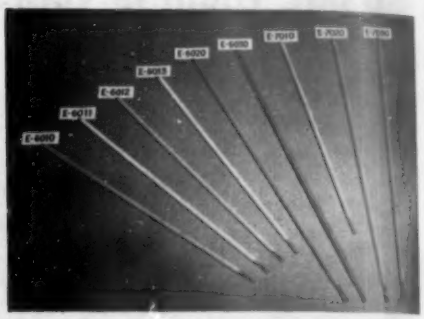
Alpert "Lil' Giant" cutter, 15 in. model.

Wire and Bolt Cutter

★ Fifteen inches overall, weighing 26 oz and having a leverage range of 40 to 1, the new Alpert "Lil' Giant" cutter will cut up to ¼ in. bolts or wires and ⅜ in. stranded cable. The standard blades are made of tool steel and will meet most requirements in general commercial practice; however, other blades can be fitted to meet special requirements. Blades are quickly removed for replacement by turning off a screw and nut. **Techtmann Industries, Inc.**, 828 North Broadway, Milwaukee.

Mild Steel Electrodes

★ The new Allis-Chalmers line of mild steel electrodes includes AWS classifications E-6010, E-6011, E-6012, E-6013, E-6020, E-6030, E-7010, E-7020 and



Allis-Chalmers electrodes for a-c and d-c welding. They are designated by the standard AWS numbers.

E-7030. To simplify selection and handling, these electrodes, both a-c and d-c types, are given the standard American Welding Society numbers and colors. They are stated to be smooth flowing electrodes with quiet arc characteristics. Further information can be obtained in manufacturer's Bulletin B6340. **Allis-Chalmers**, Milwaukee 1.

» «

Bench-type belt grinder, Model BBS.

Bench-Belt Grinder

★ Porter-Cable Model BBS bench-type belt grinder uses an endless metal-cutting abrasive belt 2½ in. wide by 60 in. long. Belt is driven by a 1 hp motor at a speed of 4,500 fpm. The design of this grinder provides a flat-bed grinding area of 2½ by 8 in. as well as a resilient contact wheel adaptable for grinding all types of metal. Though a wheel of 7 in. diam by 2½ in. wide is standard, wheels of 6 to 8 in. diameters can be used.

This type of bench grinder is said to be well suited for weld grinding, burring gears, generating radii, removing flash, flat and edge work, cleaning up and polishing. **Porter-Cable Machine Co.**, Syracuse 8

Worn or Broken Surfaces can be BUILT UP *quickly* with "997" Low-Fuming Rod

Let's help the other fellow, too.

Under the stress of present industrial output, mechanical production equipment often feels the strain. Bronze Welding is being used extensively, not only for the repair of iron, steel and copper alloy parts, but also for the building-up of worn surfaces. If you've done an interesting bronze welding job that you feel would help the other fellow, tell us about it. If of general interest, we'll pass the word along in these pages.

With five teeth gone from this large gear and an important production unit stopped dead in its tracks, what's a Production Manager to do? A new gear meant patterns, castings, days of machining—weeks of delay. Pegging the broken teeth would cut down the delay—but increase the hazard of a repeated failure.

It's in a pinch like this that the importance of Bronze Repair Welding with the oxy-acetylene torch is most appreciated—for by using this fast, economical method of repair the gear was welded, machined and back in operation in a few days. Low temperature bronze welding with "997" Low-Fuming, Tobin Bronze* and other Anaconda Welding Rods is so controllable that it is often possible to weld parts without dismantling, and in many instances, finish by filing to a template.

"Don't Scrap It...Bronze Weld It!" is more than a slogan—it's a NECESSITY in many plants. Publication B-13 contains suggested welding procedures and examples of savings in repair time and expense. Write for a copy.

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

4490

ANACONDA from mine to consumer

Anaconda Bronze Welding Rods

They Obey The Torch Quickly, Flow Freely, Seal Neatly

★ The purity of the copper (99.96%) and zinc (99.99%) composing TITAN Bronze Welding Rods accounts for the quality and uniformity of the neat bond they provide in continuous trouble-proof performance.

Processed under rigid laboratory controls, TITAN Rods are double deoxidized, contributing further to their excellence, and insuring a constant, free-flowing bond without interrupting faults in the flux. Welds are uniform, sound, strong and ductile.

Made in three groups and seven grades to provide close relationship to the work at hand, TITAN Bronze Welding Rods are the most economical because of the smoother performance and greater output they make possible.

Catalog of all grades will be mailed promptly on request.

Titan

METAL MANUFACTURING CO., BELLEFONTE, PA.
NEW YORK • CHICAGO • SAN FRANCISCO

Quality Alloys By Brass Specialists
Brass and Bronze Rod • Forgings • Die Castings • Welding Rods

High-Frequency Generators

★ Westinghouse is offering a line of high-frequency generators with ratings of 1, 2, 5, 10 and 20 kw for both induction and dielectric heating applications.

One of the new Westinghouse high-frequency generators for induction-heating applications.

In addition, units of 50 to 200 kw capacity can also be supplied.

The new units are self-contained in a single cabinet and require only electrical connection to a 60 cycle power supply (single phase for ratings of 5 kw or lower, 3 phase for 10 kw and higher). The primary voltage may be either 220 or 440.

Generators are available for frequencies of 450 kc, 5, 15 and 30 mc for ratings through 10 kw and for frequencies of 450 kc, 2 and 10 mc for 20 kw and higher. The high-frequency section is shielded to minimize interference with nearby communication circuits, and an automatic timing control permits load cycle adjustment to a predetermined time, which can be automatically repeated. Terminals are provided for remote control. Air-cooled tubes eliminate bulky water-cooling equipment, substituting instead an air blower which provides a circulation of air throughout the entire apparatus. **Westinghouse Electric and Mfg. Co.**, East Pittsburgh, Pa.

» «

Electrode for Aircraft Steels

★ Airco No. 90-A electrode is especially designed for welding the light-gauge chrome-moly and similar steels used in aircraft production. Its coating is made to a new formula said to provide smoother arc operation, better appearing deposits, stronger arc action, reduced slag interference and good operation at high currents without deterioration of coating at the stub end. Test specimens welded on SAE 4130 steel show transverse tensile strengths of 80,000 to 90,000 psi.

This electrode meets the requirements of Army Air Corps Specification 10286-B, Type 1, Grade 2E, and conforms to AWS and ASTM specifications for Classification E-6013. It is available in $\frac{1}{16}$, $\frac{5}{32}$ and $\frac{3}{16}$ in. diameters. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

(Continued on page 77)

N. E. Steel Compositions

Revised to May 26, 1944

CONDITIONS surrounding the production of alloy steels have made necessary certain changes in and additions to the chemical composition limits of the National Emergency (N.E.) steels.

The modifications were made by representatives of the Metallurgical and Conservation Branch of the Steel Division of the War Production Board; the Office of the Chief of Ordnance, Technical Division, U. S. Army; and members of the Iron and Steel Division of the Society of Automotive Engineers, the SAE War Engineering Board and the Technical Committee on Alloy Steel of American Iron and Steel Institute.

The changes were made primarily to permit greater consumption of nickel-chromium-molybdenum scrap and also to make available triple alloy steels having hardenability characteristics intermediate between previously existing series. To accomplish these ends, the following changes in and additions to National Emergency steel compositions have been made:

1. The *8700 series* has been restored in a wider variety of carbon ranges.

2. A new series, the *9700 series*, has been established. It has hardenability characteristics similar to those of the 4000 series.

3. A new series, the *9800 series*, has been established. It has hardenability characteristics about halfway between those of the 8700 series and those of the 4300 series, in the thorough-hardening carbon ranges.

4. A new series, the *9900 series*, has been established in the low-carbon ranges. It is designed especially for carburizing and has hardenability characteristics similar to or slightly in excess of the 8700 series.

CARBON-MANGANESE STEELS

	C	*Mn*	*Si*
NE 1330	0.28/0.33	1.60/1.90	0.20/0.35
NE 1335	0.33/0.38	1.60/1.90	0.20/0.35
NE 1340	0.38/0.43	1.60/1.90	0.20/0.35
NE 1345	0.43/0.48	1.60/1.90	0.20/0.35
NE 1350	0.48/0.53	1.60/1.90	0.20/0.35

NICKEL-CHROMIUM-MOLYBDENUM STEELS

	C	*Mn*	*Si*	*Ni*	*Cr*	*Mo*
NE 8612	0.10/0.15	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8615	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8617	0.15/0.20	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8620	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8622	0.20/0.25	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8625	0.23/0.28	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8627	0.25/0.30	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8630	0.28/0.33	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8632	0.30/0.35	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8635	0.33/0.38	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8637	0.35/0.40	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8640	0.38/0.43	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8642	0.40/0.45	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8645	0.43/0.48	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8647	0.45/0.50	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8650	0.48/0.53	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.15/0.25
NE 8712	0.10/0.15	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8715	0.13/0.18	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8717	0.15/0.20	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8720	0.18/0.23	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8722	0.20/0.25	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8725	0.23/0.28	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8727	0.25/0.30	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8730	0.28/0.33	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8732	0.30/0.35	0.70/0.90	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8735	0.33/0.38	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8737	0.35/0.40	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8740	0.38/0.43	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8742	0.40/0.45	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8745	0.43/0.48	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8747	0.45/0.50	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 8750	0.48/0.53	0.75/1.00	0.20/0.35	0.40/0.70	0.40/0.60	0.20/0.30
NE 9415	0.13/0.18	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9417	0.15/0.20	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9420	0.18/0.23	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9422	0.20/0.25	0.80/1.10	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9425	0.23/0.28	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9427	0.25/0.30	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9430	0.28/0.33	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9432	0.30/0.35	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9435	0.33/0.38	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9437	0.35/0.40	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9440	0.38/0.43	0.90/1.20	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9442	0.40/0.45	1.00/1.30	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15

NICKEL-CHROMIUM-MOLYBDENUM STEELS (Cont.)

	C	*Mn*	*Si*	*Ni*	*C*	*Mo*
NE 9445	0.43/0.48	1.00/1.30	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9447	0.45/0.50	1.20/1.50	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9450	0.48/0.53	1.20/1.50	0.20/0.35	0.30/0.60	0.30/0.50	0.08/0.15
NE 9722	0.20/0.25	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9727	0.25/0.30	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9732	0.30/0.35	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9737	0.35/0.40	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9742	0.40/0.45	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9745	0.43/0.48	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9747	0.45/0.50	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9750	0.48/0.53	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9763	0.60/0.67	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9768	0.64/0.72	0.50/0.80	0.20/0.35	0.40/0.70	0.10/0.25	0.15/0.25
NE 9830	0.28/0.33	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9832	0.30/0.35	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9835	0.33/0.38	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9837	0.35/0.40	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9840	0.38/0.43	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9842	0.40/0.45	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9845	0.43/0.48	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9847	0.45/0.50	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9850	0.48/0.53	0.70/0.90	0.20/0.35	0.85/1.15	0.70/0.90	0.20/0.30
NE 9912	0.10/0.15	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9915	0.13/0.18	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9917	0.15/0.20	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9920	0.18/0.23	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9922	0.20/0.25	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30
NE 9925	0.23/0.28	0.50/0.70	0.20/0.35	1.00/1.30	0.40/0.60	0.20/0.30

SILICON-MANGANESE AND SILICON-MANGANESE-CHROMIUM STEELS

	C	*Mn*	*Si*	*Cr*
NE 9255	0.50/0.60	0.70/0.95	1.80/2.20	—
NE 9260	0.55/0.65	0.70/1.00	1.80/2.20	—
NE 9261	0.55/0.65	0.70/1.00	1.80/2.20	0.10/0.25
NE 9262	0.55/0.65	0.70/1.00	1.80/2.20	0.25/0.40

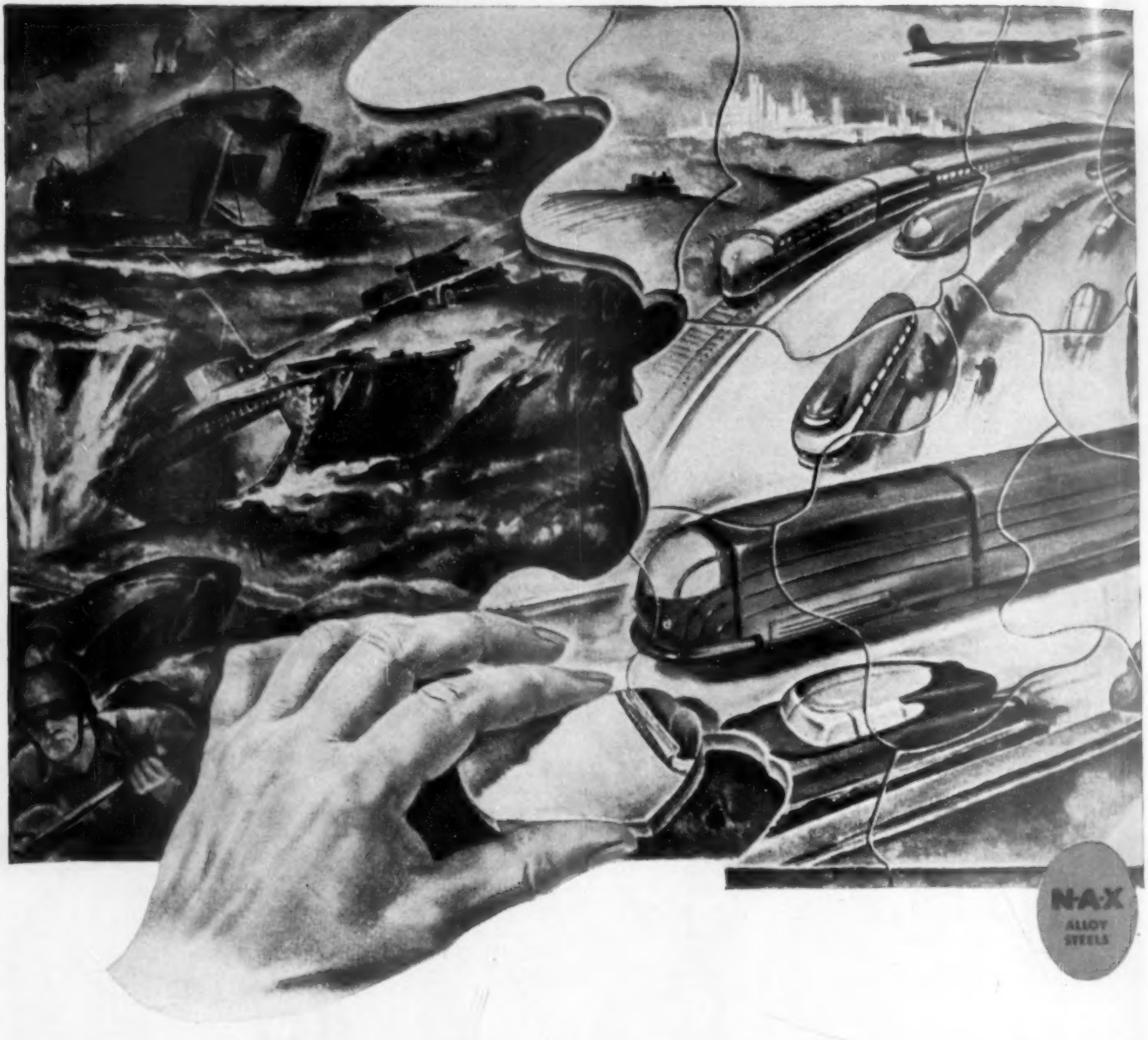
CARBON-CHROMIUM STEELS

	C	*Mn*	*Si*	*Cr*	*Ni*	*Mo*
NE 52100A	0.95/1.10	0.25/0.45	0.20/0.35	1.30/1.60	0.35 max.	0.08 max.
NE 52100B	0.95/1.10	0.25/0.45	0.20/0.35	0.90/1.15	0.35 max.	0.08 max.
NE 52100C	0.95/1.10	0.25/0.45	0.20/0.35	0.40/0.60	0.35 max.	0.08 max.

NOTE 1. When electric furnace steel is specified, phosphorus and sulphur contents are to be 0.025% maximum each.

NOTE 2. All National Emergency steels are subject to the conditions outlined for standard steels as listed in Steel Product Manual No. 10 covering alloy steels, pages 14 to 17 inclusive, and page 26. Large sizes are subject to modification of carbon content only to a range of 0.10 as outlined on pages 23 and 26 of the same Manual.

A new picture is forming



That popular dream of tomorrow's better world is not all fantasy. Many factors that must shape it are already established—they are fitting themselves together, bit by bit, in an unmistakable pattern.

Various war perfected materials, for instance, will inevitably change the American scene. Take N-A-X HIGH TENSILE for example. Its amazing strength and toughness will certainly mean lighter weight, less bulky, more durable products of peace—more efficient, more economical planes, trains and motor vehicles—better, less expensive furniture, home appliances and other everyday items that will form our future.

N-A-X HIGH TENSILE and N-A-X 9100 SERIES STEELS are now employed in practically every type of war equipment. This wide battle application is indicative of their great versatility—their phenomenal strength, toughness and resistance to impact and fatigue—their superior formability and fabricating efficiency.

And these are the prime ingredients with which to build important parts of a new and better world.

GREAT LAKES STEEL CORPORATION

DETROIT (18), MICHIGAN • SALES OFFICES IN PRINCIPAL CITIES

DIVISION OF NATIONAL STEEL CORPORATION EXECUTIVE OFFICES, PITTSBURGH, PA.

New Products

(Continued from page 72)

Welding Goggle

★ An improved AO "Duraweld" goggle has eyecups which have been anatomically molded for the right and left eyes. These eyecups have larger, more comfortable edges and are rounded to fit flush against the contour of the face. They are shallow but have deep sides.

Improved AO "Duraweld" goggle for welding operations. Newly designed eyecups and side shields are features.

Newly designed side shields provide increased ventilation to keep the eyes cool and help prevent lens fogging. Louvers are so made, states manufacturer, that it is impossible for stray light rays or sparks to reach the eyes. Headband is in one piece, easily adjustable and resistant to perspiration, oil, water and grease. Bridge is covered with curved plastic tubing, which fits snugly over the bridge of the nose and can be quickly adjusted.

"Noviweld" lenses in shades 3, 4, 5, 6 or 8 are standard equipment for these welding goggles. Other types of lenses are optional, however, including "Noviweld Didymium" lenses for absorbing yellow sodium flare and "Super Armorplate Calobar" lenses for persons working near welding operations. **American Optical Co.**, Southbridge, Mass.

» «

Aluminum Solder

★ Sheet aluminum can now be lock-seamed (or lapped and spot-welded or riveted) and the joint sealed with a new free-flowing soft solder, EutecRod 199, just developed by the **Eutectic Welding Alloys Co.**, 40 Worth St., New York City 13. This improved solder supplants the alloy previously known as EutecRod 19B for use on aluminum and aluminum alloys. It is used on aluminum as the old lead-tin solders would be used on tinplate or brass and copper. Though in long laps it will make joints of moderate strength, it should generally be used as a seal. This rod will work on cast aluminum as well as on wrought aluminum and on steel, copper and nickel alloys, but it is limited to applications where the soldered joint will not be heated over the boiling point of water (212° F).

HOW TO SAVE TIME

CLAMPING and RELEASING WORK

Here are a few Typical Cases

A Knu-Vise Clamp Model KK-250 is used here to hold a part steady in a fixture during drilling.

Parts to be welded for fuselage frame are held together in this fixture with four Knu-Vise KV-210 clamps.

Two aircraft parts are held together with eight Knu-Vise Pliers No. KL-431 to align them for drilling and riveting operations.

Use of Knu-Vise enables you to start operations the instant the parts are placed in fixture. Flip of lever holds parts firmly in place with predetermined pressure. No time is wasted screwing down or releasing clamp.

BUY MORE WAR BONDS

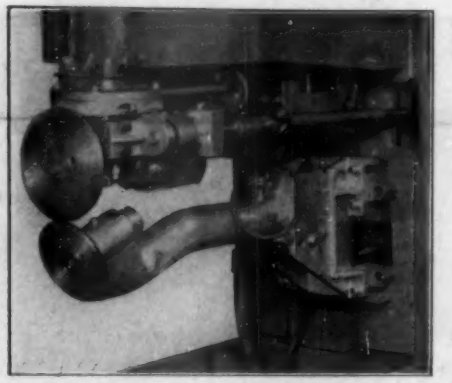
KNU-VISE INCORPORATED

1336 Plum Street, Detroit 16, Michigan
4328 San Fernando Rd., Glendale, Calif.

Seam Welder

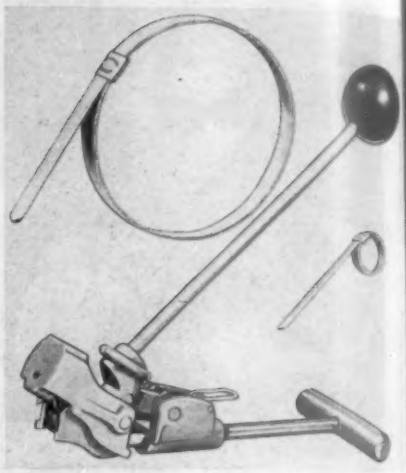
★ A new Thomson seam welder has been specially adapted for welding close to the corners of box-shaped or angular assemblies. As the illustration shows, the lower welding wheel is in an angular position, permitting seam welds to be made close to the corners of metal boxes, ducts, etc. An angular set may be given to both the upper and lower welding wheels if conditions warrant.

In the welder pictured, the upper wheel is gear driven while the lower wheel idles. A variety of other driving arrangements is available: gear or kurl drives may be applied to either the upper or lower wheel or to both welding wheels, depending on the requirements of the particular work. The Model 25 seam welder pictured is equipped with a double-acting air cylinder to supply the welding pressure and with variable speed drive. **Thomson-Gibb Electric Welding Co.**, Lynn, Mass.



Thomson Model 25 seam welder with angular set lower wheel for close-to-corner welding.

» «



"Punch-Lok" hose clamp and locking tool. Various types of fittings or pipe can be connected to a hose or welding cable spliced.

Hose Clamp

★ The "Punch-Lok" hose clamp, available for fittings from ¾ in. OD to 48 in. ID, is a mechanical device for connecting various kinds of male and female fittings, nipples, menders or ordinary pipe to hose. Once the clamp has been locked, neither vibration nor rough handling can loosen it, states manufacturer.

In making the connection, a broad, flat band of galvanized steel is double wrapped around the joint and tensioned with a pull of 1,000 lb by a locking tool. The ends are then locked together without loss of tension within a flat clip of pressed steel. The excess band is cut off flush with the clip, streamlining the joint.

The same method of banding and clamping may also be used for splicing welding cable, stopping leaks in steam and water lines, tying rigid conduit or flexible cable to pipe lines, seizing ends of wire or manila rope, etc.

The No 3 clamp has a ⅜ in. band width and is designed for hose ranging from ¾ in. OD to 1⅝ in. ID. Other clamps have a band width of ⅝ in. and range in diameter from 1 to 48 in. ID. The clamps may be obtained in "Everdur" (copper-base alloy) for applications for which corrosion resistance is essential. **Punch-Lok Co.**, 321 N. Justine St., Chicago 7.

» «

Bending Machines

★ A new line of Thomas bending and straightening machines, in six sizes, permits cold bending and straightening of beams, channels, rails, shaftings, rounds, squares, forgings, structural sections or other metal sections. These machines can bend beams from 5 to 24 in. **Thomas Machine Mfg. Co.**, Pittsburgh 23.

Milburn Type N Cutting Torch. Meets Highest Performance Standards.
MILBURN
Regulators (High & Low Pressure)
Cutting & Welding Equipment
Spray Guns
Portable Carbide Lights
Write for Literature
The ALEXANDER MILBURN Company
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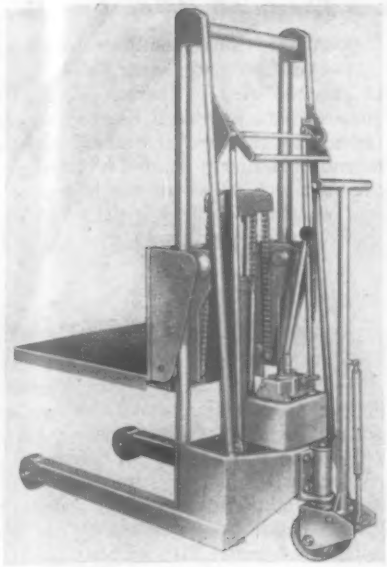
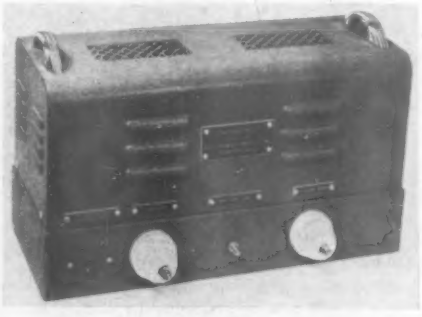


Lyon-Raymond "High-Lift" is a combined lift and tiering truck having a capacity of 1,000 lb and a raising range of 42 in.

High-Lift Truck

★ The new Lyon-Raymond hydraulic "High-Lift" truck is a combined lift truck and tiering machine. Made of tubular and formed steel construction, it is comparatively light in weight (495 lb), easily manipulated and turns readily within its own length. It is equipped with a floor lock and a "fingertip controlled" lowering device. The standard model has a capacity of 1,000 lb, a platform 24 in. wide by 30 in. long and is able to raise its load from 6 in. (lowered position) up to 48 in. **Lyon-Raymond Corp.,** 1631 Madison St., Greene, N. Y.

» «



"Trignitrol." An electronic switch for discharging the condenser bank in a resistance-welding control circuit.

Electronic Control Switch

★ The "Trignitrol" is a positive-acting electronic switch designed to supersede mechanical switching on resistance welding equipment of the capacitor (electrostatic) type. It is said to discharge the condenser bank instantly and completely through the welding transformer.

The firing tube, the "Trignitron," is a mercury-pool conduction tube that is fired capacitively by a low-power trigger circuit. Four connections will permit installation of the "Trignitrol" on any standard 110 or 220 volt, 60 cycle a-c circuit. **Electronic Power Co., Inc.,** 19 W. 44th St., New York City 18.

P.S.-BOOTH F621 NAT'L METAL CONGRESS. Bring your sample parts—we'll braze them on the spot!

SHIP US YOUR PARTS with an outline of service conditions and physical properties required. We'll promptly return your parts perfectly bonded with a clean NU-BRAZED joint Nu-Braze alloys are available to meet all standard and government specifications. Nu-Brazed joints have tensile strength up to 100,000 lbs. per sq. in. Joints are non-corroding, leak-proof, highly conductive to electricity and will withstand constant shock and vibration. Low working temperatures (1175° F. to 1300° F.) do not affect metal properties or cause embrittlement of modern alloys. We will also forward samples of the proper grade of NU-BRAZE with recommendations for best silver brazing procedure. There's no charge or obligation.

Mark your samples to the attention of Mr. Shaw.

CLIP THIS COUPON FOR TEST SAMPLES

Please forward at once generous test sample of your

NU-BRAZE GRADE III ☐
1300°F. silver-phosphorous alloy for joining copper, brass, bronze

NU-BRAZE GRADE VI ☐
1175°F. easy-flowing alloy for joining like or unlike ferrous or non-ferrous metal and alloys

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CITY & P. O. ZONE _____ STATE _____

SHERMAN & CO. 197 CANAL ST., NEW YORK 13, N. Y.

Do You Agree?

Soldering Stainless Steel

Q—I would like to tin 18-8 stainless steel so that I can solder an electric-light wire to the piece. The solder would be of the 70-30 type. Can you give us any suggestions on this?—*E. C. C.*

A—There is no particular problem presented in soldering stainless steel. If pickled sheets are employed, ordinary zinc chloride or cut acid with commercial solder will give fair results. If stronger joints are desired, it would be well to use a special stainless-steel soldering flux, of which there are several on the market. Polished steel should be roughened with emery cloth to obtain adhesion and then soldered with a large soldering iron at as low a temperature as possible in order to keep buckling to a minimum. When the joint is completed, it should be washed with a 5% soda solution to neutralize the remaining acid, which will corrode the metal if not removed.

Thermit-Welding Crucible

Q—What is an automatic crucible?—*E. H.*

A—An automatic crucible is a type of crucible used in thermit welding. Its purpose is to provide a fireproof container for holding the thermit material during the thermit reaction. After the reaction, the thermit steel settles to the bottom of the crucible from which it is drawn off into a previously prepared mold.

» «

Spark Testing

Q—What is spark testing?—*R. A. H.*

A—Spark testing is a simple means of determining the kind of metal at hand without making a chemical analysis It has been ascertained that each metallic material will produce a distinctive spark pattern when touched lightly to a grinding wheel. For further details see page 784 of *The Welding Encyclopedia*, 11th edition.

» «

Endothermic Acetylene

Q—What is meant when it is said acetylene is endothermic?—*T. E. D.*

A—An endothermic substance is one that is capable of absorbing heat during production and later liberating it during combustion. Acetylene possesses this quality.

» «

Hold-Time

Q—In resistance welding, reference is sometimes made to hold-time. What is the meaning of this term?—*C. L. Y.*

A—Hold-time is a part of the welding cycle. It is the time during which pressure is maintained on the resistance-welding electrodes after the cessation of flow of welding current.

» «

Types of Wear

Q—In a recent discussion dealing with wear of metallic parts, a speaker said that such parts would be subject to five kinds of wear. What are these kinds of wear? —*C. B. C.*

A—The five common types of wear to which materials are subject are: (1) abrasion, a grinding action caused by abrasive solids rolling, rubbing or sliding against the surface of the wearing material; (2) corrosion, the result of oxidation or of other chemical actions to which metallic parts are subjected by the action of liquids and heat; (3) erosion, the scouring action of liquids, vapors and gases traveling at high velocity on the wearing surfaces of the metal; (4) galling, the adhesion or cohesion of localized areas of two bearing surfaces of metal followed by the tearing away of small fragments from one of the bearing surfaces, and (5) impact, those light or heavy blows which tend to deform the surface of the wearing metal and result in cracking or chipping of that surface.

If you, as a reader, do not agree with our answers, let us know your thoughts. Your comments and discussions will be published, too.

IT'S *Quicker* TO USE A CMD *Triple Duty* CHIPPING HAMMER

Triple Duty TYPE CB

3 tools in one. Brush replaceable when worn. Well balanced. Weight 1 lb.

This convenient tool has a chisel in one end of the head and a drift in the other and a removable wire brush on the end of the handle. The user does not have to set aside the rod holder to chip or brush away slag from the weld. This model is one of many in the CMD line famous for quality for 22 years. Write Department 9-W for latest circular for complete details.

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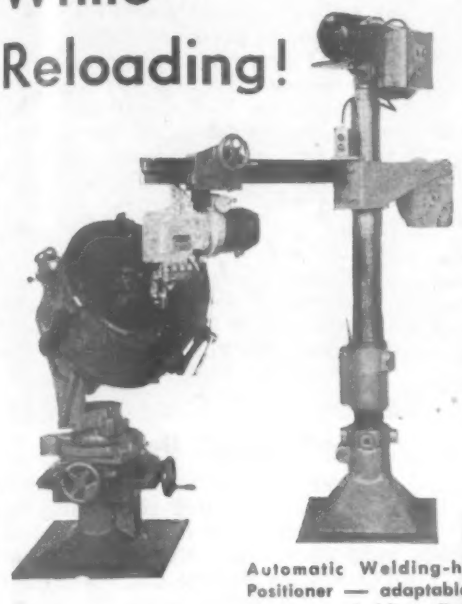
Save Time While Reloading!



Automatic Welding-head Positioner — adaptable to your own holding fixture.

How TO SPEED UP WELDING OPERATIONS!

Use This Dual Automatic Welding Fixture!

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

WRITE
for information relating to your particular welding fixture problem

ACME Manufacturing Co.
1642 HOWARD ST. • DETROIT, MICH.

SAVE GAS . . . SPEED UP PRODUCTION WELDING with the new Gasweld "69" ECONOMIZER

• This unique device saves both man hours and welding gas—two important factors in these busy war days. The "Economizer" is a "must" for all production welding operations.

SAVES GAS—Torch burns only when actually welding.

SAVES TIME—Where intermittent welding is done it is unnecessary to relight and readjust torch each time a weld is started.

Hanging the torch on the convenient arm automatically shuts off both gas control valves in the "Economizer" . . . picking up the torch automatically opens the valves . . . a touch to the pilot flame lights the torch instantly, ready for work, without readjustment of the gas mixture.

The convenience of the "Economizer" can be yours at an amazingly low cost. Write for prices and further information.

Torch illustrated is the lightweight Gasweld AV-10 ideal for aluminum and light metals, one of a complete line of Gasweld torches and gas welding equipment.

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Cincinnati 4, O.
Chicago 23, Ill.
Detroit 8, Mich.
Louisville 2, Ky.
Milwaukee 2, Wis.

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The Liquid Carbonic Corporation
3110 S. Kedzie Ave., Chicago, Ill.

Rochester 8, N. Y.
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Toronto, Ontario
Windsor, Ontario

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

Aircraft Steel Standards

AWS "Weldability Standards for Alternate Aircraft Steels" sets forth a series of tests to enable comparison of the proposed alternates with standard aircraft steels. The prescribed tests (selected from the standpoints of both reliability and ease of performance in the usual aircraft plant) include the tee-bend test, transverse butt-joint tension test of ¼ in. plate, transverse butt-joint tension test of ⅛ in. sheet, transverse butt-joint tension test of tubing and the welded double-tube triangle test. Test specifications cover test plate dimensions, filler metal sizes, preheating and welding procedures as well as testing methods.

A copy of this 20-page, 6 by 9 in. bulletin may be obtained for 25c from the **American Welding Society,** 33 West 39th St., New York City 18.

» «

Ship Failure Data

The causes of failure in welded ships as well as suggested means for overcoming them are presented tentatively in a report, "Structural Failures in Welded Ship Construction," of the AWS Subcommittee on Hull Construction. This report, an extension of the principles stated in the previously published, "Thermal Stresses and Shrinkage in Welded Ship Construction," covers the factors of residual stresses, reaction stresses and stress concentrations, and gives ways to reduce each. It is published as a 12-page, 6 by 9 in. bulletin and available at 25c per copy from the **American Welding Society,** 33 West 39th St., New York City 18.

» «

"Fleet-Welding" Booklet

"Fleet-Welding," a new technique for increasing the speed of welding mild steel, is described in a 48-page, letterhead-size booklet (No. 440 published by **The Lincoln Electric Co.,** Cleveland, O. This book tells how to use "arc force" to increase welding speed and gives the effect of penetration on welding costs, factors affecting production speed and general information for the use of its 17 separate procedure tables on various types of butt, fillet, lap, corner and edge welds. Each table lists plate or sheet thickness, recommended electrode type and size, recommended current, polarity, arc speed, etc. and lb of electrode deposited per ft of weld.

» «

Storage Battery Welding

"The How and Why of Storage Battery Welding," a 12-page, 4 by 8½ in. booklet, asks and answers some 35 questions relating to the operation, maintenance, design and installation of "battery" resistance-welding equipment. This equipment, states the booklet, is applicable to most forms of resistance-welding—spot, projection, butt welding, etc.—and to aluminum, stainless steel, alloy steels, plain carbon steels and any other material capable of being resistance welded. **Progressive Welder Co.,** 3050 E. Outer Drive, Detroit 12.

» «

Gas Equipment Catalog

The 24-page letterhead-size Imperial Catalog No. 334-B pictures and describes welding, cutting, brazing and lead-burning equipment offered for both the oxy-acetylene and oxy-hydrogen processes. There are several complete outfits for welding, for cutting, for welding and cutting, for brazing and soldering, and for lead burning; these may be bought on a single-price deal. In addition, the catalog also shows welding and cutting torches, regulators, pressure gauges, welding hose and fittings, goggles, cylinder trucks, etc. **The Imperial Brass Mfg. Co.,** 1200 W. Harrison St., Chicago 7.

5-TON BRASS MELTING FURNACE REPAIRED
with No. 192 Low Fuming Bronze

FACTS for WELDERS... Here's the most practical, up-to-date data on selecting and using welding rods for best results. Write for your copy.

Time and again it has been demonstrated that brazing with Bridgeport Rod can accomplish jobs "impossible" with other welding methods and materials. Because brazing requires only *local preheating of the base metal to a cherry red,* dangerous stresses and local brittleness caused by excessively high temperatures are eliminated. Frequently the brazed part is considerably stronger than before.

In this case brazing saved the cost and delay of a new casting, machining, assembling and relining with fire brick. What is more important it prevented a serious loss in production of vital war materials.

For your next "impossible" job, switch to brazing and specify "Bridgeport" bronze rods—low melting point, easy flow, good tinning action, and exceptional *adhering* properties.

Write for free booklet containing practical suggestions on the selection and use of Bridgeport Bronze Welding Rods.

BRIDGEPORT BRASS

"Bridgeport" BRASS

BRIDGEPORT 2, CONN. • ESTABLISHED 1865
BRIDGEPORT BRASS COMPANY

WRITE FOR YOUR RESERVATION

Moslo goes every step of the way in manufacturing complete equipment for electrode processing plants for laboratory or production.

TO

MOSLO'S WELDING ROD PLANT SHOW

Once again Moslo opens for demonstration a complete welding rod processing plant—Many new features have been added to the Moslo line.

Don't miss the Moslo Show!

Open soon.

BY APPOINTMENT ONLY

MOSLO MACHINERY COMPANY

2441 PROSPECT AVENUE CLEVELAND, OHIO

2400% *Profit!*

THE Sight Feed Acetylene Generator pictured herein has been on the job, indoors and out, for more than 20 years. Its owner says it has brought him more than a 2400% return on his original investment. Maintenance expense has been less than $10 in all the 20 years of trouble-free, profit-making service. Sight Feed will do as well for YOU in the next 20 years. Order today.

THE *Sight Feed* GENERATOR COMPANY • SALES: RICHMOND, IND. • FACTORY: W. ALEXANDRIA, O.

A-C Welder Bulletin

A two-page leaflet is published by **Hampton Electric Mfg. Co.**, 12th Street and Pine Place, New Kensington, Pa., to describe the series "H" line of "stepless-current" a-c welders. These are lightweight welders suitable for use in garages, small plants, machine shops, sheet metal shops, etc.

» «

Vest Pocket Guide

Hobart's "Welders' Vest Pocket Guide" is a useful 24-page, 3½ by 6¼ in. booklet giving the main facts about arc welding in a form for quick reference. Handy weld and trouble check-charts tell what's wrong with the weld and with the machine. Other topics covered include: characteristics of the welding arc (bare, shielded and carbon), types of joints, welding symbols, etc. **The Hobart Brothers Co.**, Troy, O.

» «

Weld Test Booklet

A 16-page, letterhead-size booklet, ADI-889, is devoted to the Airco tensile and guided-bend testing machine. In addition to description of the machine (see page 60, August, THE WELDING ENGINEER), data are given on the preparation of specimens for standard tests and the calculation of test results. An alignment chart for computing tensile strength is also included. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

Anti-Spatter Bulletin

A six-page, letterhead-size bulletin issued by **The Midland Paint and Varnish Co.**, 9115 Reno Ave., Cleveland 5, describes practical tests that were made to determine the effects of using an anti-spatter fluid in welding. In addition to laboratory reports on tests for determining weld strength, this bulletin also gives a suggestion for keeping welding jigs free from spatter and presents a report on the suppression of fumes during welding.

» «

Valve Chipper Chart

A 22 by 38 in. cardboard wall chart, "Easy Repair Operations for I-R Flapper Valve Chippers," should make the servicing of this particular chipping hammer a comparatively simple procedure. The chart is graphically illustrated with an "exploded view" of the hammer, a number of cross-sections of its various parts and drawings of even the tools required for proper maintenance. **Ingersoll-Rand Co.**, 11 Broadway, New York City 4.

» «

Electrode Specification Chart

Superseding all previous Arcos charts is a new one that gives the following data on stainless steel and ferritic-alloy welding electrodes: (1) weld-metal chemical composition of 42 stainless and alloy electrodes; (2) heat-treatment specifications of the welded structure for the more important stainless and alloy grades; (3) identifying grade information. **Arcos Corp.**, 401 North Broad St., Philadelphia, 8.

» «

Safety Equipment Catalog

An 8-page, letterhead-size catalog has been issued by **Eversafe Industrial Equipment Co.**, 219 Flatbush Ave., Brooklyn 17, to show a line of welding goggles, chipping goggles, eyeshields, helmets, lenses, cover glasses, etc.

» «

Lubricating High-up Bearings

Elimination of the hazards due to the manual lubrication of high-up and hard-to-get-at bearings on presses, cranes and other "off the floor" types of equipment is discussed in a four-page, letterhead-size bulletin, "Aloft is no Place for A. W. O. L. (absent without lubrication) Bearings." This bulletin explains the application of a system for sending lubricant under pressure from a central pumping unit to every bearing on the machine. **The Farval Corp.**, 3248 East 80th St., Cleveland 4.

YOU'RE
"in the groove"
With a
MARQUETTE A.C. ARC WELDER
Literally or figuratively . . . that expression applies perfectly to Marquette Welders.
In its literal sense, the secret lies in the way Marquette employs the inherent advantages of a.c. current, making possible flawless welds even in deep angles and grooves. There is no "magnetic blow" to pull the arc out of line . . . only perfect arc control, which naturally results in stronger, more uniform and better looking welds. Figuratively . . . in the jargon of the rug-cutter . . . it's the sweet, smooth performance of these versatile machines, on all types of fabrication or repair, that puts you "in the groove" and gives you the fast, flawless, low cost welds for which Marquettes are noted.
LOW ORIGINAL COST—LOW COST OPERATION
NEGLIGIBLE UPKEEP—COMPLETE EQUIPMENT
10 MODELS, 125 TO 400 AMPS.
Send for free, 24 page, illustrated booklet.
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MARQUETTE
REGISTERED U.S. PAT. OFFICE
a.c. arc welders

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With Resisto-Loy hard-facings there is no guesswork!

RESISTO-LOY — Resists corrosion, severe abrasion and medium impact. Easily applied to any iron or steel base material. Will not shatter nor flake off under impact. Brinell above 600. For A.C. and D.C. metallic arc and oxy-acetylene application.

ISOROD (Self Hardening) — Resists severe impact, heavy shock and abrasion. Applied easier than mild steel. Is an all-position rod. Horizontal, vertical or overhead. Extremely low spatter loss. Deposits are forgeable without loss of wear or impact resistance. Brinell 540 to 560. For A.C. and D.C. metallic arc and oxy-acetylene application.

"Two-Tone" T. H. — A special high speed applicational hard-facing alloy for use as a filler rod with a mild steel live electrode. Deposits are TOUGH and HARD with all the characteristics of a good steel base hard-facing alloy.

"Two-Tone" H. C. — An alloyed rod designed to give exceedingly tough, high-shock resisting deposits that are forgeable without loss of valuable properties.

Mango-Tone N. M. — A highly alloyed nickel-manganese rod designed to deposit 5% nickel, 14% manganese metal by the "Two-Tone" process for high speed repairing of cast manganese steels. Deposits possess all the desirable properties of nickel manganese, such as work hardening and high physical strength.

All three of the "Two-Tone" alloys represent a real advancement in the technique of rapidly depositing hard-facing, high-impact, self-hardening, forgeable and nickel manganese alloys for repairing and rebuilding heavy duty, mining, dredging, quarrying and earth moving equipment.

Write for Bulletin No. 7 on "Two-Tone" alloys and save time and dollars.

Resisto-Loy COMPANY
GRAND RAPIDS 7, MICHIGAN

Anti-Spatter

"FOR BETTER WELDING"

ANTI-SPATTER practically eliminates oxidation—cuts down the amount of slag covering weld. It also fortifies the action of rod coating—less slag, easier to remove. Weld rust practically eliminated.

Easy to apply—simply brush on before welding. After welding, **ANTI-SPATTER** is easy to remove. If surface is to be painted, remove with wet cloth or usual degreasing methods—otherwise use dry rag.

Get speedier and better looking production and save man hours in costly cleaning. **ANTI-SPATTER** is non-inflammable, non-toxic and has no disagreeable odors.

WRITE TODAY FOR DESCRIPTIVE FOLDER ON ANTI-SPATTER

TRI-FLUX
A new and hotter soldering flux.
No. 5 for Stainless and Monel Metal.
No. 3 for All other metals.
Write for details.

Distributors write us.

FLAME-PRUF
Ideal protection for welders' clothes.
Odorless, low cost, easy to use.
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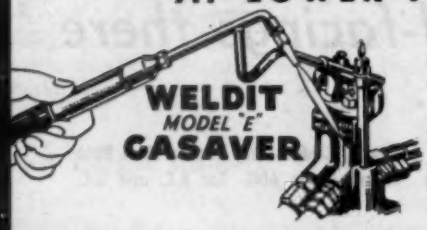
THE WOLFE-KOTE CO.

SHEBOYGAN • WISCONSIN

Safe Welding

AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

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MANGANAL

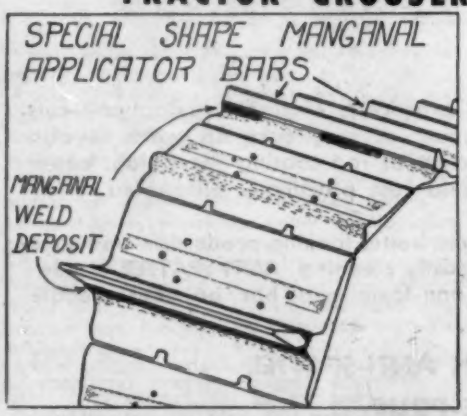
(Reg. U. S. Pat. Office. U. S. Patents 1,876,738—1,947,167—2,021,945)

SPECIAL SHAPE

APPLICATOR BARS

FOR

TRACTOR GROUSER RE-TREADS



MADE IN FIVE SIZES EASILY WELDED TO ANY SHAPE OR SIZE GROUSER. PROVIDES A RE-TREAD FOR ALL TRACK LAYING TYPES OF EQUIPMENT.

Attach with Manganal Bare or Special Tite Kote welding electrodes.
Applicator bars are manganese nickel steel, the toughest metal known. Work hardens under impact and abrasion.
New parts are difficult to obtain. Saves approximately 80% of the metal of a new part, as well as time and money.

150 Distributors Are Ready to Serve You
Sole Producers

STULZ-SICKLES COMPANY
134-142 Lafayette St., Newark, N. J.
Try Seaco Hard Surfacing Over Manganese Weld Deposits

Weltronic Control Bulletins

Two technical bulletins describing resistance-welding control units have been issued by the **Weltronic Co.**, 19500 West Eight Mile Road, Detroit 19. Bulletin No. WT-40-41 covers the application, operation, description, specifications and features of the improved Models 40 and 41 electronic seam-welder controls. Bulletin No. WTH-44 contains descriptions, applications, specifications and features of the new "package unit" heat controls which provide variable phase-shift regulation of welding current for virtually every resistance-welding process including spot, seam, pulsation, butt and flash welding.

» «

Safety Pamphlet

Aimed primarily at the smaller war plants which cannot afford to employ trained safety engineers, "Safety through Management Leadership," a 20-page, 6 by 9 in. publication of the Div. of Labor Standards, cites the actual experiences which plants of varying sizes have had in organizing for safety. The booklet discusses the organization of safety committees and their proper fields of activity and gives training and supervision suggestions. A copy can be obtained free (while the free supply lasts) from the Div. of Labor Standards, U. S. Department of Labor, Washington 25, D. C.

» «

"Sewing with Steel"

A 16-page, 10¾ by 8¼ in. two-color pictorial booklet attractively presents specific instances of its theme that, "Modern Industries Sew with Steel." The sewing machine is, of course, the arc welder, and the pictures show typical metal-joining jobs in the oil industry, in subway and tunnel digging, in housing and building construction, in shipbuilding, in aircraft plants, automobile factories, etc. **The Hobart Brothers Co.**, Troy, O.

» «

Mogul Catalog

A 16-page, letterhead-size catalog and price list (as of July 1, 1944) covers the Mogul metallizing gun and auxiliary equipment including air regulator, air filter, wire reel stand, gas regulator, oxygen regulator, sandblast generators, blast cabinet, spray booth, air compressors and parts, electric bonder and "Nervous Weld" equipment. **Metallizing Co. of America**, 1330 W. Congress St., Chicago 7.

» «

Apprentice Training Booklet

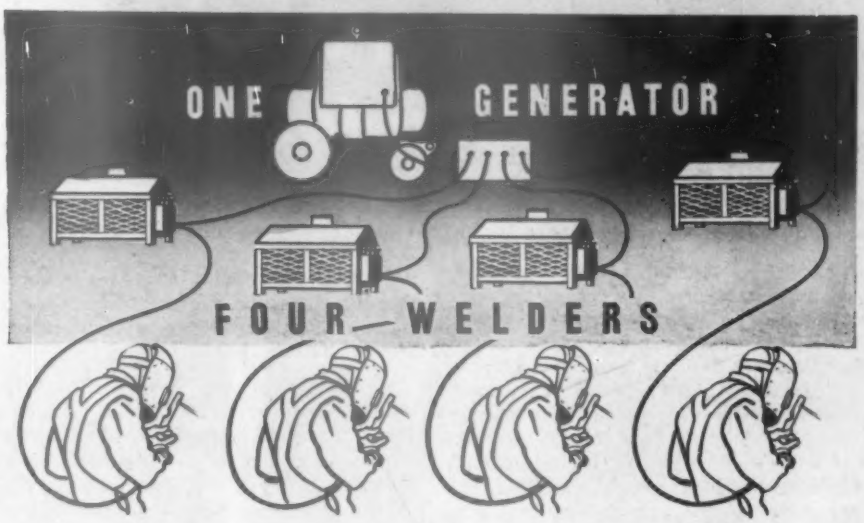
How management and labor collaborated in an apprenticeship program to meet the continuous need for skilled maintenance men required by a large transportation company is told in an 8-page, letterhead-size pamphlet available from **Apprentice-Training Service**, Bureau of Training, War Manpower Commission, Washington, D. C.

THE BIGGEST NEWS IN WELDING TODAY!

STEVENS

TUFFLINE

WELDING RESISTOR UNIT



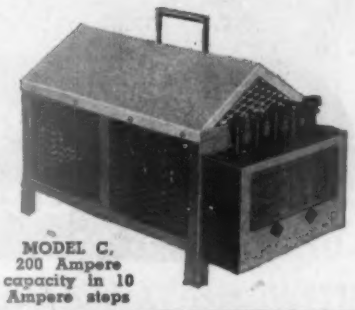
IMMEDIATE DELIVERY

$96.00 LIST PRICE

Discounts on Request

Generators are hard to get . . . expensive. Even with high priorities, deliveries are long delayed and uncertain. The remedy for this situation is to install STEVENS TUFFLINE WELDING RESISTOR UNITS. They multiply your generating capacity by 3 and 4 times at a small fraction of the cost of additional generators.

Thousands of Stevens Welding Resistor Units are working night and day on production lines from coast to coast, including nearly 75% of the nation's shipbuilding concerns. Demonstrations of any Tuffline product given without obligation. Catalogs showing all Tuffline products sent upon request.



MODEL C. 200 Ampere capacity in 10 Ampere steps

C. H. STEVENS & COMPANY 216 E. 45TH ST., NEW YORK 17, N. Y. TEL.: MU 2-4894
SACRAMENTO, CALIF.: 3216 SACRAMENTO BLVD., SACRAMENTO 5-2388

EASY-FLO RINGS

"WED" METALS TOGETHER FOR KEEPS

It's the fashion today to join metals with preplaced rings of EASY-FLO silver brazing alloy wire—first, because low-temperature EASY-FLO means fast, reliable, low-cost brazing—second, because preplacing the alloy speeds production, gives accurate control of amount of alloy and assures uniform distribution throughout a joint—and finally, because metals joined by EASY-FLO will never be parted by vibration, shock or extremes of temperature. They're one for keeps. START NOW to get the benefit of EASY-FLO's speed, reliability and economy in your metal joining operations present and future. BULLETIN 12-A tells you how. Write for your copy today.

EASY-FLO fabricated Air Speed Indicator Part. 6 joints in upper assembly brazed simultaneously—then 10 in lower. EASY-FLO rings preplaced at all joints.

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News of the Industry

Annual AWS Convention at Cleveland, Oct. 16-19

Around 60 technical papers covering various phases of the welding and cutting industries will be presented during the 25th annual meeting of the American Welding Society, to be held Oct. 16 to 19 at the Hotel Cleveland, Cleveland.

As has been the custom with former conventions, three simultaneous sessions will be held during each of the morning and afternoon periods throughout the four days of the convention. Subjects slated for discussion at these sessions include: welding and cutting in heavy industries, railroad and transportation, weldability, resistance welding, research, structural, ships, aircraft, machinery, piping and pressure vessels, production and ordnance, foundry, etc.

A feature of this year's convention will be a talk by Admiral H. L. Vickery, U. S. Maritime Commission, on "Welding as an Aid in Shipbuilding Construction." This will be given as part of the "Welding Aids the War Effort" program at the opening session on Monday morning.

Members of the Society who have not yet made their reservations are urged to write at once to: Housing Committee, National Metal Congress, 1604 Terminal Tower Bldg., Cleveland 13.

» «

War Conference Displays at 26th Metal Congress

An extensive exhibit of processes and tools used by metal-working industries to further the war effort will be featured at the 26th annual National Metal Congress and War Conference Displays, to be held at Cleveland's Public Hall, Oct. 16 to 20, under sponsorship of the American Society for Metals.

In addition to the panel-type production sessions and other activities of the American Society for Metals, the annual meetings of four other participating organizations will be held at Cleveland during the same period. These are: American Welding Society; American Institute of Mining and Metallurgical Engineers, Iron & Steel and Metals Div.; American Industrial Radium and X-Ray Society; Society for Experimental Stress Analysis.

» «

New General Electric Movie, "The Story of A-C Welding"

A worthy successor to the popular General Electric films, "Inside Arc Welding" and "Inside Atomic-Hydrogen Welding" is the latest member of the welding movie series, "The Story of A-C Welding." The new all-color 16 mm film has just been released for exhibitions sponsored by G-E arc-welding specialists and distributors. It is in two parts and requires about 35 minutes to exhibit.

Like its predecessors, the new sound film was produced by the Raphael G. Wolff Studios, Hollywood, under the technical supervision of the G-E laboratories. Actual production-welding scenes, laboratory demonstrations, close-ups of the arc and the molten steel are artfully combined with animated sketches. The latter are interspersed at frequent intervals in order to illustrate some of the more technical points in a lighter manner.

The film opens with a comparison between a-c and d-c welding. The elimination of arc blow is then taken up in some detail, followed by a pictorial presentation of the four major factors of a-c welding technique: current setting, travel speed, length of arc and angle of electrode. The advantage of using large electrodes and higher currents concludes Part I of the film.

Part II gives a detailed portrayal of profitable a-c welding applications.

» «

Sam Tour at New Address

Sam Tour & Co., Inc., is now located at 44 Trinity Place, New York City 6. This firm does consulting engineering and metallurgical work.

The Best Phosphor Bronze Electrodes You Can Use

EDCO

Yellow Shielded

ELECTRODES

18-Inch Center and 14-Inch End Grip

● You can't select a better phosphor bronze electrode than EDCO YELLOW SHIELDED . . . the rod that is used and endorsed by railroads, shipyards, refineries, aircraft and many others. EDCO YELLOW SHIELDED ELECTRODES may be specified for all types of electric bronze welding with complete confidence. They are manufactured exclusively by EDCO.

SOLE MANUFACTURER

ECCLES & DAVIES MACHINERY CO.

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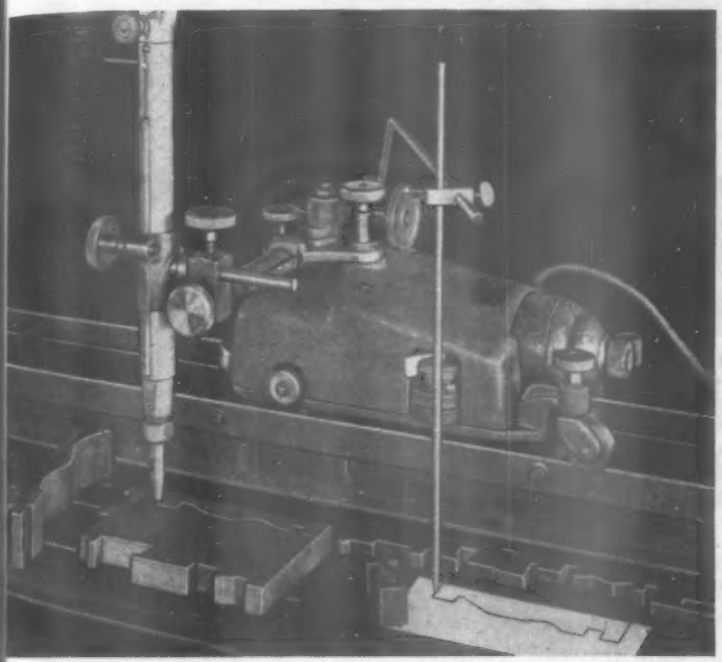
LOS ANGELES, CALIFORNIA

DISTRIBUTORS IN ALL PRINCIPAL CITIES

INDUSTRY'S MOST VERSATILE

Flame Shaper

. . . CUTS STRAIGHT, CURVES, BEVELS AND INTRICATE SHAPES



SCHRADER-BOWERS Model "D"... with worm-geared lateral carriage

Included among the features of this outstanding new Model "D" Flame Shaper are:

- STEPLESS CUTTING SPEEDS—ranging from 4 to 40" per minute.
- NEW CENTRIFUGAL GOVERNOR—assures accurate speed control without rheostats, gears or clutches.
- AUTOMATIC BRAKE—stops torch accurately on the line.
- CONTROL SIMPLICITY—one switch provides forward, reverse, and neutral.
- AUTOMATIC FREE WHEELING—permits quick hand-positioning on track.
- RUGGED, CONSTANT-SPEED MOTOR—eliminates variable speed troubles.
- DOUBLE TORCH MOUNTING—permits use of additional torch for double work.

Write today for descriptive literature and prices.

●

Model "E" Flame Shapers are similar to Model "D" units except that the carriage is rack-and-pinion type instead of worm gear driven. Model "E" is a machine of unusually fine performance that is competitively priced. Both Model "D" and Model "E" Flame Shapers are manufactured by . . .

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SOUTH BEND 14, INDIANA

Eastern Sales and Service:
EASTERN EQUIPMENT COMPANY, INC.
WILLOW GROVE, PENNSYLVANIA

CANADIAN RADIUM IN MODERN INDUSTRY

...A THROUGH-AND-THROUGH EXAMINATION WITH CANADIAN RADIUM WILL TELL YOU

Radium's Gamma-rays can penetrate solid steel many inches thick, and provide clear, permanent records of any internal defects.

Plants regularly using Canadian radium to check important metal parts in the earliest production stages, are obtaining valuable data on their foundry technique and insuring the soundness of their products. A radium radiograph often reveals defects which can be corrected—and repairs verified—before entailing added machine, labor and shipping expenses.

IN AMERICA'S LEADING LABORATORIES radium has proven indispensable for conveniently examining steel, bronze, brass and other metal parts ranging from ½ to 10 inches in thickness.

R-44

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Reliable, profusely illustrated 80-page textbook on the fundamentals and technique of modern Industrial Radiography of Metals with Radium. Specially prepared for the metals industry by our research and technical staff. Write for your copy today, giving your name and company position.

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CORPORATION
630 FIFTH AVE., ROCKEFELLER CENTER, NEW YORK 20, N.Y.

Warren City Mfg. Company Acquired by Graham-Paige

Graham-Paige Motors Corp., Detroit, has acquired the capital stock of the Warren City Mfg. Co., Warren, O., which now becomes a wholly owned subsidiary of the motor car manufacturer. Warren City Mfg. Co. was built and equipped by the U. S. Navy in 1942 at cost of $9,000,000. The plant and equipment are at present being used for welding, fabricating, machining and assembling heavy types of Navy production.

The combined volume of war production of the Detroit and Warren factories is currently about $60,000,000 annually.

» «

Move Building to Add to Titan Metal Plants

The removal of a building from New Castle, Delaware, to Bellefonte, Pa., to serve as an addition to the plants of the Titan Metal Manufacturing Co., is part of a $1,500,000 expansion program that is expected to double Titan's production of brass rods. The project, financed by the Defense Plant Corp., includes the building and equipping of a new melting, extruding and cold-finishing brass mill. Between 100 and 200 additional employees will be added when the new facilities are completed.

The expansion is part of the Army's new program to accelerate the production of heavy artillery and big gun ammunition.

» «

Pullman-Standard Unveils Postwar Commuter Coach

An example of what the commuter may expect in the way of railroad service after the war is provided by drawings of a proposed "Threedex" coach, recently made public by the Pullman-Standard Car Mfg. Co. This coach, it is stated, will provide the short-distance commuter with the comforts and conveniences that are now available only in luxury streamliners.

The name "Threedex" is derived from the three separate levels of the projected coach. Passengers will enter at either side on a middle level (the same height as the floor level of present coaches) and ascend a central stairway to the top deck or descend two side stairways to the lower deck. Altogether, 112 passengers can be seated. There are also four game rooms (two at each end of the coach on the middle level) and four washrooms and toilets. Wide windows on each deck will flood the car with daylight.

» «

Alloy Rods Company to Build New Plant

Final authorization from the War Production Board has been given to the Alloy Rods Co., York, Pa., for the immediate construction of a new plant. The company has acquired a five-acre site in West Manchester township on the Lincoln highway for this purpose. The new plant will be a two-story, all-brick structure approximately 270 ft long. Complete laboratory facilities for chemical and metallurgical control and research are to be included.

» «

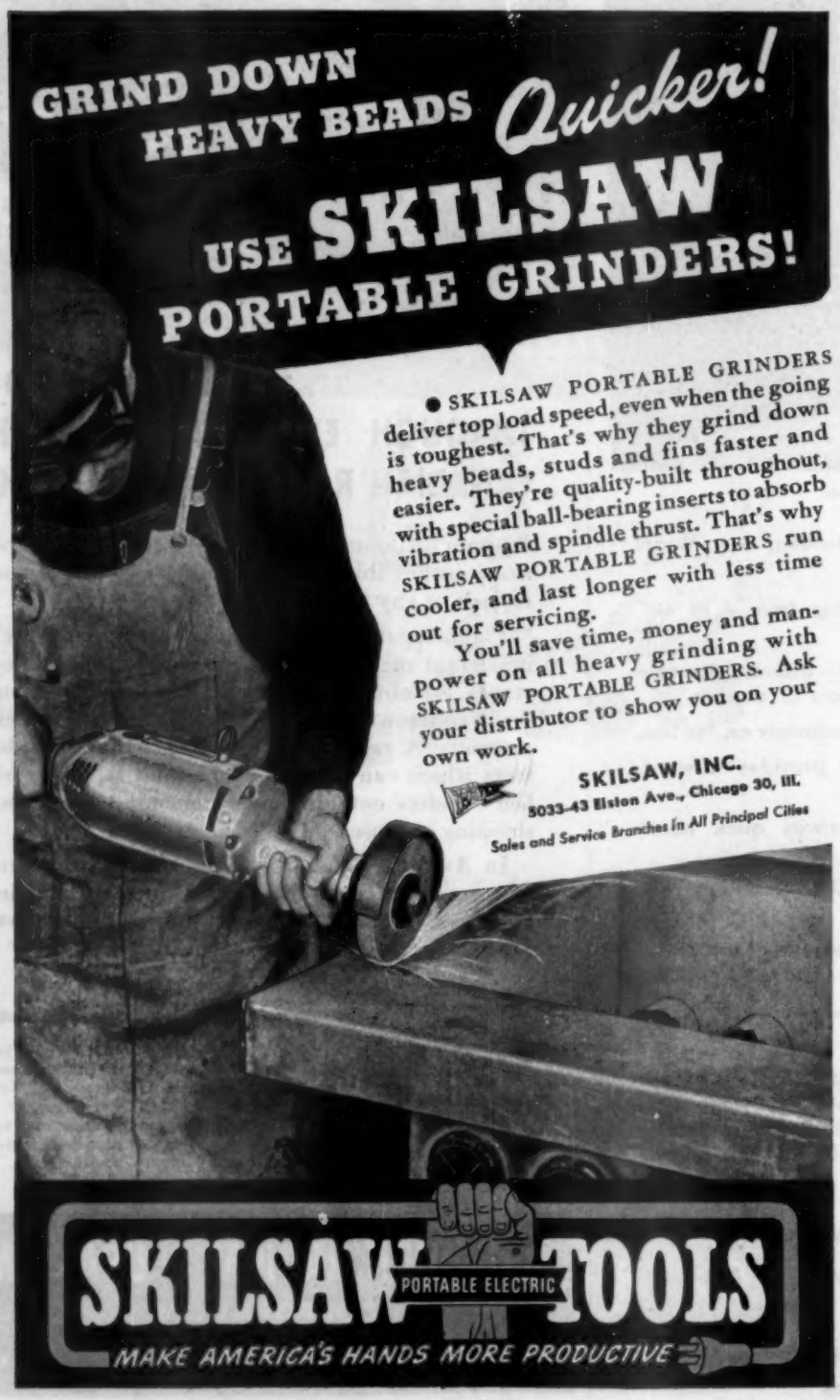
U. S. Steel Acquires Bennett Manufacturing

The United States Steel Products Co., sheet-steel-fabricating subsidiary of United States Steel Corp., has acquired the manufacturing assets of Bennett Mfg. Co., manufacturer of steel drums. The Bennett company's plants at Chicago and New Orleans will be operated as the Bennett Mfg. Division of U. S. Steel Products.

» «

Society for Stress Analysis Meets Oct. 17-19, Cleveland

The fall meeting of the Society for Experimental Stress Analysis will be held at the Carter Hotel, Cleveland, Oct. 17, 18, 19 and 20, during the same week as the National Metal Congress and the American Welding Society convention. Inquiries should be addressed to the Society, P. O. Box 168, Cambridge 39, Mass.


GRIND DOWN HEAVY BEADS Quicker!
USE SKILSAW PORTABLE GRINDERS!
● SKILSAW PORTABLE GRINDERS deliver top load speed, even when the going is toughest. That's why they grind down heavy beads, studs and fins faster and easier. They're quality-built throughout, with special ball-bearing inserts to absorb vibration and spindle thrust. That's why SKILSAW PORTABLE GRINDERS run cooler, and last longer with less time out for servicing.
You'll save time, money and manpower on all heavy grinding with SKILSAW PORTABLE GRINDERS. Ask your distributor to show you on your own work.
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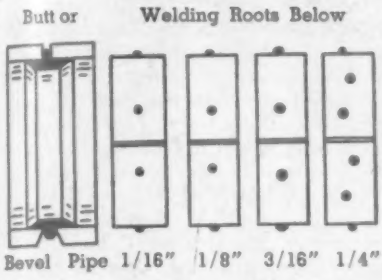
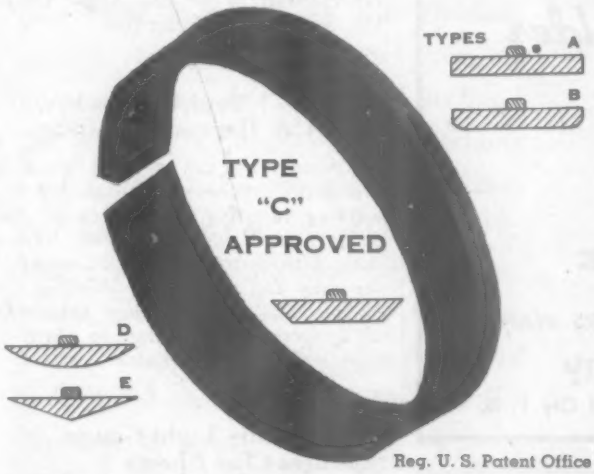
SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

THE Robvon
Backing Ring & Fabricating Co.



Approved by Navy Dept. BUREAU OF SHIPS AS A NAVY STANDARD and U.S.C.G., U. S. Maritime Commission and oil refineries, and fire insurance underwriters.

- X-Rays and radiographs a perfect welded joint.
- Pipe and fitting ends butt welding root spacers which automatically sets welding pass.
- Eliminates necessity for tack welding—no clamps, guides or fixtures—no ridge to burn through in melting down.
- Pipe and fitting ends self aligned by butting spacers and tension holds ring in place.
- Nubs melt in weld puddle allowing complete penetration and fusion.
- Small size and circular shape of the nub permits surface tension of molten metal to form a meniscus which assists in preventing burn through.
- Forms perfect welded joint—no slag, icicles or metal inside causing damage.



Reg. U. S. Patent Office

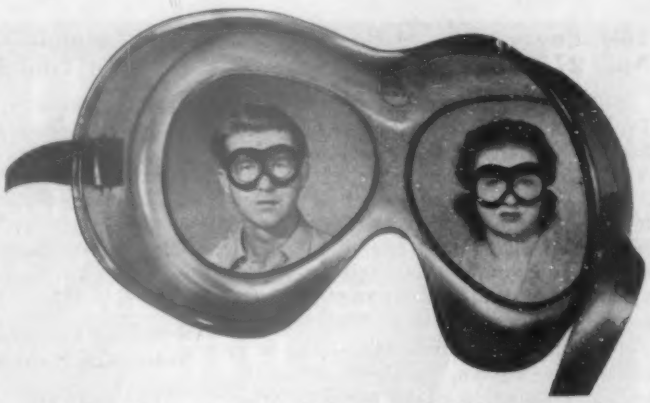
SPECIFICATIONS: "C" IRON PIPE OR TUBING SIZE WITH DOUBLE BEVELED EDGE.

—3/4" to 2 1/2"—11/16" wide x 3/32" thick.
—2" to 20"—1" wide x 1/8" thick.
From 3/4" to 3 1/2"—3 nubs. From 4" to 6"—4 nubs.
From 8" to 12"—5 nubs. From 12" and up—6 nubs.
—1/16", 1/8", 3/16" welding root single line centered nubs.
—1/4", welding root 1/8" wide nub staggered so that too much metal is not removed from the ring.

NATIONWIDE DISTRIBUTION

Expanded Metal Engineering Co., New York City, N. Y.
May Supply Co., Mobile, Alabama.
Grinnell Co. of the Pacific, Washington and California.
H. S. Wood Co., Portland, Oregon.

WELDING RING



You're Looking Through the New CESCO *Cover-Lite* Goggles

Cover-Lite Goggle lenses are *replaceable*

● As you're looking through these new CESCO *Cover-Lite* Safety Goggles you're practically experiencing their comfort, too. When you actually have them on, you scarcely know they're there.

Why, the combined weight of the lenses and the frame is only 96/100 of an ounce! And, the frame rests lightly on the brow, nose and cheeks —no pressure anywhere. They're comfortably worn over spectacles, too.

Notice the clear plastic, non-shattering, replaceable lenses. They have remarkable strength—and assure safety against impact. Also, the colored plastic frame serves as an eye shade, to eliminate reflections and reduce eye strain. The goggles are available with transparent green (No. 552) or white marbleized (No. 554) frames; also available with green, glare-reducing lenses.

Write for complete information on this amazing, new *Cover-Lite* goggle now.

HOW TO SELECT INDUSTRIAL HEAD AND EYE PROTECTION

Before you buy safety equipment, see CESCO'S new 48-page catalog. It's the standard for quality... write for your copy today.

CESCO

CHICAGO EYE SHIELD CO.
2330 Warren Boulevard • Chicago 12, Illinois

CESCO
FOR SAFETY

16th Power Show to Be Held Nov. 27 to Dec. 2, New York

The 16th National Exposition of Power and Mechanical Engineering will be held in Madison Square Garden, New York City, November 27 to December 2. The event will be keyed to the effective solution of war-production problems, particularly those caused by sudden shifts in military needs. It will also provide informational sources for the advancement of postwar planning.

The National Power Show, as it is commonly known, is held biennially under sponsorship of an advisory committee. The last such exposition was held in 1942.

Wall-Colmonoy Forms New Machine Tool Welding Div.

Wall-Colmonoy Corp., Detroit, has organized a machine tool welding division to be located at 19351 John R St., Detroit 3. This division will handle all of the company's custom and contract welding in connection with the application of hard-facing alloys and overlay metals.

» «

Whiting Corp. Appoints Nebraska Representative

Whiting Corp., Harvey, Ill., has appointed the Cardinal Supply & Mfg. Co., 427 Sunderland Bldg., Omaha, as its exclusive sales representative in the Omaha territory (Nebraska and western Iowa) for Whiting cranes, railroad equipment, foundry equipment, aviation equipment and Quickwork metal-working machinery.

» «

Battelle Institute Honored

The War Department has granted the Ordnance Distinguished Service Award to Battelle Memorial Institute, research organization of Columbus, O. Battelle Institute has conducted research for the Ordnance Department, the Bureau of Ships, the Army Air Corps, the Watertown Arsenal, the War Production Board, the Defense Plant Corp., the Office of Scientific Research and Development, the National Defense Research Committee, the National Academy of Sciences and others. It has also worked on many war research projects for private industry.

» «

Tool Engineers to Meet in Syracuse, Oct. 12-14

The twelfth semiannual meeting of the American Society of Tool Engineers will be held in Syracuse, N. Y., Oct. 12, 13 and 14. The Hotel Syracuse will serve as convention headquarters. Past President Ray H. Morris, of Hartford, who is in charge of the program, announces that arrangements have been completed for a discussion of the machining of magnesium alloys by representatives of the Dow Chemical Co. and other authorities.

» «

More "E" Awards Won by Handy & Harman, Whiting

Keeping up the general good war-production record of companies in the welding industry, employees of Handy & Harman, Bridgeport, Conn., have won their fifth Army-Navy "E" award, and the men and women of Whiting Corp., Harvey, Ill., have earned the addition of a second white star to their company's original "E" flag.

» «

Jessop Adds Light-Gauge Stainless-Clad Sheets

Through the addition of new production equipment, the Jessop Steel Co., Washington, Pa., is now able to furnish fabricators with light-gauge stainless-clad steel sheets. Thicknesses from 16 to 12 gauge can now be produced in widths from 24 to 50 in. and in lengths up to 120 in. Eighteen-gauge sheet can be furnished in the same widths and in lengths up to 96 in.

» «

Salkover Moves Chicago Plant

Salkover Metal Processing Co., a firm specializing in controlled-atmosphere electric furnace brazing and in bright annealing, has moved its Chicago plant from 3249 West Ohio Street to 4209 West Lake Street.

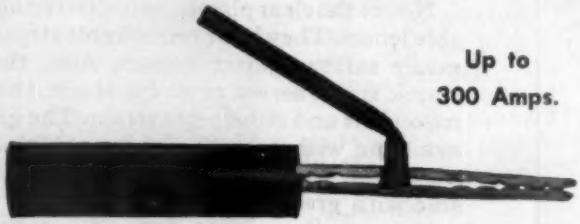
Two Additions to the METRO SAFETY EQUIPMENT Line

Metro's New Coveralls

Transparent for chipping and grinding—shatterproof lenses—as shown above.

Also available in Black for welders.

Metro's New Electrode Holder



Up to 300 Amps.

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Metro Manufacturing Company

38-11 Thirty-first Street Long Island City 1, N. Y.

As You Never Drove Before!

HARNESS THE 4 ADVANTAGES

YORK'S 77 CAST IRON BRAZING FLUX

TO SALVAGE CRITICAL MATERIAL AND GREATLY INCREASE PRODUCTION ALL ALONG THE LINE

1 Fear of overheating can be forgotten.

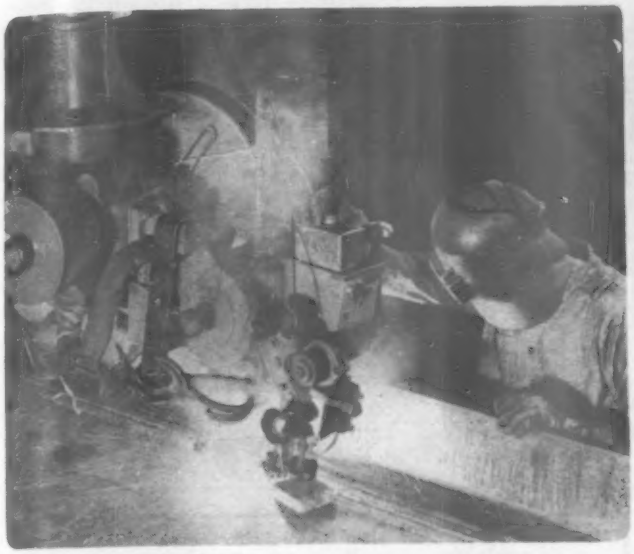
2 Cleaning and grinding are unnecessary with "York's 77". Send for FREE Sample.

3 Chipping is unnecessary with "York's 77". A satisfactory bond is always guaranteed.

4 Deteriorated cast iron can be welded with "York's 77".

YORK ENGINEERING COMPANY • 3349 OGDEN AVENUE CHICAGO ILLINOIS

Better Carbon Arc Welds



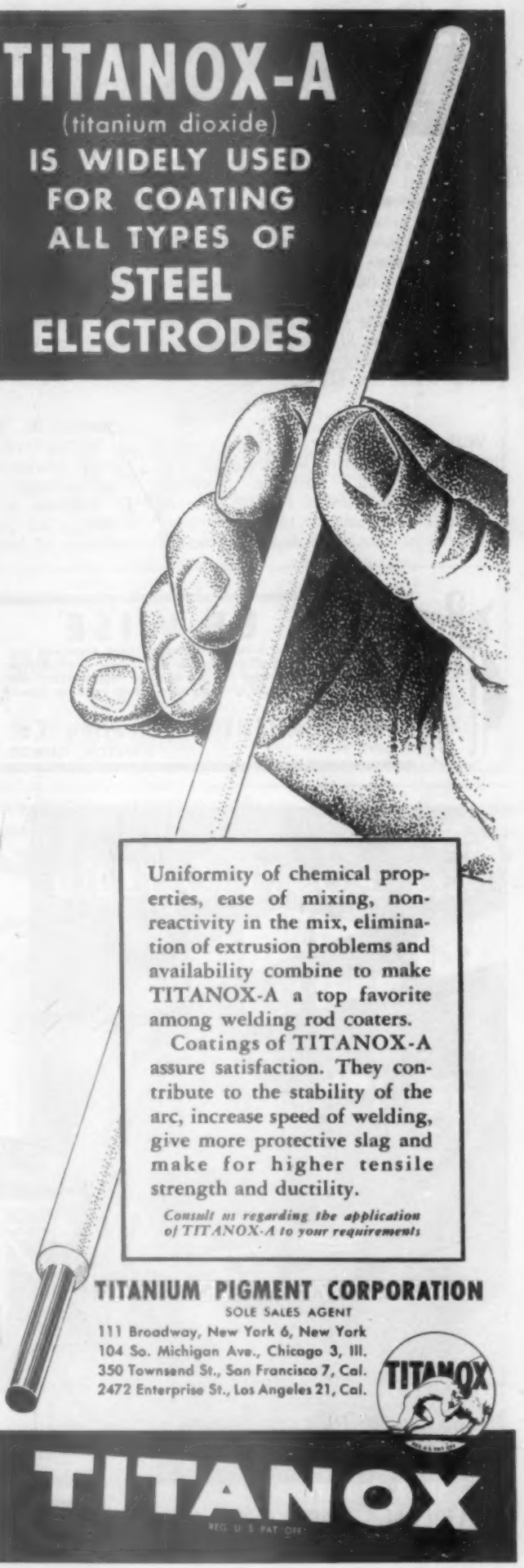
with HOLDARK ELECTRODES

The even, steady burning arcs and high heat value that you get with Holdark carbon electrodes make for stronger, more uniform welds in any job. In hand and machine welding, Holdark carbons have proven 22% stronger and harder, give 13% more weld per inch and 30% longer life than the best carbon electrodes used previously. Over forty-five years of technical and manufacturing skills go into the making of SPEER Holdark carbons. Use them for most work per inch.

TITANOX-A

(titanium dioxide)

IS WIDELY USED FOR COATING ALL TYPES OF STEEL ELECTRODES



Uniformity of chemical properties, ease of mixing, non-reactivity in the mix, elimination of extrusion problems and availability combine to make TITANOX-A a top favorite among welding rod coaters.

Coatings of TITANOX-A assure satisfaction. They contribute to the stability of the arc, increase speed of welding, give more protective slag and make for higher tensile strength and ductility.

Consult us regarding the application of TITANOX-A to your requirements

TITANIUM PIGMENT CORPORATION

SOLE SALES AGENT

111 Broadway, New York 6, New York
104 So. Michigan Ave., Chicago 3, Ill.
350 Townsend St., San Francisco 7, Cal.
2472 Enterprise St., Los Angeles 21, Cal.

TITANOX

TITANOX

REG. U. S. PAT. OFF.

ABOUT PEOPLE

E. E. LeVan, formerly vice-president and general manager, has been elected president of Haynes Stellite Co., a unit of Union Carbide and Carbon Corp., succeeding the late **Francis P. Gormely.** Mr. LeVan has been associated with Haynes Stellite since 1922, serving successively as sales engineer, chief engineer, general sales manager and vice-president. He will continue to make his headquarters at Kokomo, Ind., where the Haynes Stellite general offices and plant are located.

» «

William J. Priestley has been elected president of Electro Metallurgical Co. of Canada, Ltd., Michigan Northern Power Co. and Union Carbide Co. of Canada, Ltd. to succeed the late Francis P. Gormely. Mr. Priestley was chief of the Alloy Steel Division of WPB during 1942. He first became associated with Electro Metallurgical Co. in 1923 as consulting metallurgist and became vice-president in charge of sales development in 1932.

» «

William M. Haile, formerly with the Linde Air Products Co., has been named director of the General Industrial Equipment Division of WPB. Mr. Haile joined WPB in August, 1942, as chief of the Gas Welding section, and he has for the past several months been chief of the Liquid, Gas Handling and Welding Equipment branch of the General Industrial Equipment Division.

» «

Joseph W. Frazer, former president of Willys-Overland Motors, has been elected chairman of the board of the Graham-Paige Motors Corp. **Raymond J. Hodgson** continues with the latter company as president and as general manager of both the Detroit plant and the newly acquired Warren, O., plant (see page 92).

» «

Fred R. Cooper has been appointed to the executive staff of the Warren City Mfg. Co., Warren, O. Mr. Cooper was formerly assistant to the president of Willys-Overland, Joseph W. Frazer, who was recently elected chairman of the board of Graham-Paige Motors as told elsewhere in this section.

» «

Stevens A. Bennett, formerly of Bennett Mfg. Co., has been appointed a vice-president of the United States Steel Products Co. in charge of the latter's new Bennett Mfg. Division.

» «

G. Shaw Scott has resigned as secretary of the Institute of Metals, London, England, an office he has held for 36 years. **K. Headlam-Morley** will act as secretary of the Institute of Metals while continuing as secretary of The Iron and Steel Institute.

YOU'LL **BE WISE**

To Remember and Investigate Independent Acetylene and Oxygen Cylinders, as to quality and price—available on suitable priorities—let us know your requirements and rating and we will be glad to obtain best possible schedule for you.

INDEPENDENT Engineering Co.

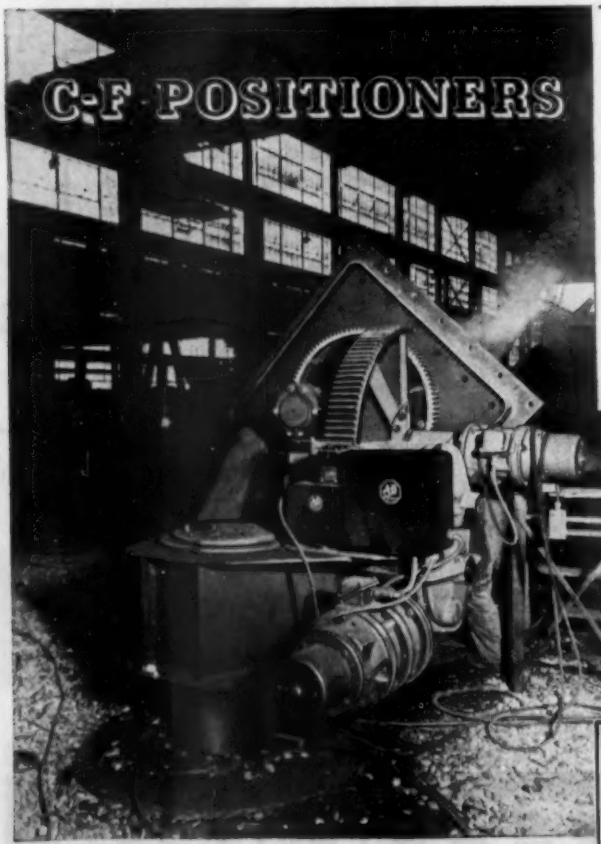
DEPT. 74 O'FALLON, ILLINOIS

HELP SAVE STEEL
BY APPLYING WIESE UNITS TO AGRICULTURAL TOOLS
Prepare your shop for this type of work

U. S. Patents 2,013,818, 2,051,234 and 2,226,884.

ELECTRIC WELDED
Write for new catalog now

WIESE PLOW WELDING COMPANY, PERRY, IOWA
Originally New Process Plow Welding Co.



A Better Job more Safely Done!

C-F Positioners permit more welding in the same time, more safely, save crane and sling crew time, save floor space. It's stronger, better welding, too,—uniformly stronger joints and smoother, neater fillets and beads which eliminate excessive grinding.

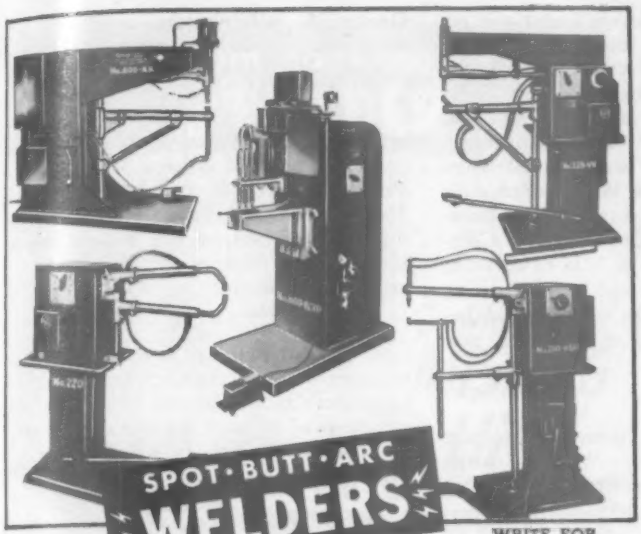
Permit you to make downhand welds on all sides, surfaces and angles with a single setup, to use large rods that require fewer passes. Table revolves 360°, tilts to 135° beyond horizontal—adjustable for height. C-F Positioners are provided in capacities to 30,000 lbs. hand or push-buttons control operation. Table rotation from 0 R.P.M. up. Pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22

Photographed at Clearing Machine Corp.

CULLEN-FRIESTEDT COMPANY

1309 So. Kilbourn Ave. Chicago 23, Ill.



WRITE FOR CATALOG

We manufacture a complete line of resistance spot welders from ¼ to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

TRANSFORMERS OF ALL TYPES

WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.

CHAS. EISLER
EISLER ENGINEERING CO.
749-SO. 13th ST. Near AVON AVE. NEWARK N. J.

WRITE TODAY for the COLMONOY Catalog

Full information about the complete line of COLMONOY Hard Facing Alloys. Illustrates typical applications. Describes methods of applications. Gives Rockwell hardness, composition and characteristics. An instructive catalog that should be in the files of every man who must solve the problems of wear and corrosion.

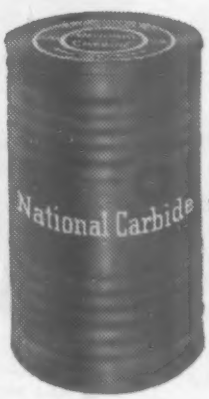
WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit 2, Mich.

BRANCH OFFICES IN NEW YORK, BLASDELL, N. Y., CHICAGO, TULSA, LOS ANGELES, SAN FRANCISCO AND IN CANADA.

National Carbide

- EFFICIENT
- ECONOMICAL
- DEPENDABLE



For Welding and Cutting *Specify*

NATIONAL CARBIDE IN THE RED DRUM

NATIONAL CARBIDE CORPORATION

60 E. 42nd St., New York 17, N. Y.

The NEW, IMPROVED Variable-Core type

GREYHOUND

A. C. Arc Welders Provide LOWER OPERATING COSTS for HEAVY DUTY PRODUCTION

Detailed information and prices sent on request

Distributors Wanted

GREYHOUND A. C. ARC WELDER CORP.
Manufacturers
520-28 Morgan Ave., Brooklyn, N. Y.

"GENERAL" WELDING FUME EXHAUSTERS

For effective elimination of the *Noxious Fumes* from

Arc Welding

Galvanized Iron Soldering

Spray Painting, Etc.

TWO TO TEN INLETS—

For multiple hose connections in shop and field operations.

SINGLE INLET UNITS—

For exhaust from booth collector ducts; and in the smaller units.

High Velocity Exhaustion by High Speed Centrifugal Fans for Small, Easily Handled Hoses

---

SEMI-PORTABLES—

Movable by crane hook or carrying bar; or for fixed (duct) service. ¾ to 15 motor horsepower.

PORTABLE "JUNIORS"—

40 to 100 pounds in weight; one or two inlet nozzles.

Self-closing caps on all nozzles.
Rugged, all-steel construction.
Metered for continuous service.
Controls protected within base.

Bulletin CB-103 gives specifications and dimensions for the 28 types and sizes comprising the "General" line.

GENERAL BLOWER CO.

403 N. Peoria St., CANal 6340
New York CHICAGO 22, ILL. Detroit
Pittsburgh Philadelphia Cleveland

Frank L. LaQue, development and research division of The International Nickel Co., Inc., has been elected chairman for the current year of the American Coördinating Committee on Corrosion. **Dr. George H. Young,** Mellon Institute of Industrial Research, was named vice-chairman, and **George W. Seagren,** also of Mellon Institute, was elected secretary-treasurer. The Coördinating Committee was organized in 1938 to serve as a clearing house and coördinating agency for information on progress being made in the field of corrosion prevention.

» «

E. J. DelVecchio, formerly assistant sales manager of Taylor-Winfield Corp., has joined the Progressive Welder Co., Detroit, as field sales manager.

» «

Harry S. Rose, formerly chief sales engineer of Progressive Welder Co., has been named sales manager for the Detroit district.

» «

Wilbur E. Geiser has returned to his post as manager of the Philadelphia office of Tube Turns, Inc., after having been "on loan" for eight months to the scheduling department of the WPB Valve and Fittings section.

» «

James H. Withers has been placed in charge of the reopened office of Tube Turns, Inc., in the Van Nuys Building, Los Angeles. Mr. Withers has been associated with valve, fitting and industrial supply firms on the West Coast for the last nine years.

» «

E. A. Hertzler, formerly associate professor of Electrical Engineering at Pratt Institute, has been named director of war research for the United Electronics Co., Newark.

» «

W. A. Siegfried has joined Superior Valve & Fittings Co., Pittsburgh, as assistant to the vice-president.

» «

T. L. Nelson has been placed in charge of the newly expanded electrode service engineering department of National Carbon Co., Inc., which now consists of two divisions. **Dr. Charles H. Chappell** is in charge of the electrothermic service division, and **Dr. Neal J. Johnson** heads the electrolytic service division. Mr. Nelson was formerly in charge of the quality division, concentrating on problems of quality control. Dr. Chappell has been in charge of the electrothermic division of the Niagara Falls laboratories, and Dr. Johnson has been head of the Niagara Works laboratories.

» «

Eugene B. Mapel has been appointed supervisor of administration planning, Carnegie-Illinois Steel Corp. He succeeds **George A. Whitehurst,** resigned. Mr. Mapel was formerly manager of personnel and training, sales department.

» «

Harold L. Wilson, a member of the personnel staff of Lukens Steel Co., By-Products Steel Corp. and Lukenweld, Inc., Coatesville, Pa., has been appointed assistant to the general superintendent in charge of personnel relations for Lukens.

» «

A. B. Johnson has been named plant manager of the Cleveland Pneumatic Tool Co., Cleveland. He has been with this company for 28 years, serving most recently as master mechanic.

» «

Conrad W. Wallin has been appointed plant manager of Cleveland Pneumatic Aerol, Inc., a wholly owned subsidiary of Cleveland Pneumatic Tool Co. Mr. Wallin joined the latter concern in 1940 to assist in the planning of plant expansion.

» «

Frank Lau, formerly supervisor of the factory accounting division, has been appointed director of industrial relations of Willys-Overland Motors, Inc.

» «

Died . . .

Primus P. C. Clark, president, The Clark Controller Co., Cleveland, died suddenly on July 8, 1944.

ANOTHER AMCOWELD SAFETY "MUST"

Durably made of chrome leather with exclusive features including:

- **FULL PROTECTION**—*even for overhead welding.* Flaps are provided under arms, and collar can be turned up snugly about neck.
- **UNIQUE DESIGN** insures full freedom of movement.
- **ADEQUATE VENTILATION** prevents discomfort.

FOR FULL DETAILS WRITE TO . . .

EASTERN EQUIPMENT CO., INC.
INDUSTRIAL SAFETY DIVISION
WILLOW GROVE, PENNA. (PHILA. DISTRICT)
MANUFACTURERS OF AMCOWELD PRODUCTS

...From Bookkeeper to **WELDER**...

with the "**MISSING LINK**" HY-CYCLE UNIT

Quick Shipments on AA-5 PRIORITY or HIGHER $59.50 COMPLETE

STARTS THE ARC AUTOMATICALLY *and keeps it going!*

This hi-frequency unit can be attached to all welders. Super-imposes over a million cycles. Constant flow of current, automatic arc and other features increase speed and ease of operation. Arc starts *before* rod touches work. Excels on 22 gauge as well as heavy. No arc blow. Burns any rod, steel or alloy, bare or coated. No "scratching or sticking" of electrode to work. These and other features make it easy for even a bookkeeper to become a good welder quickly. A big help to experienced welders too. We urge you—order the "MISSING LINK" today...it will work wonders in your welding department.

If its a welding problem we can help you!

See Your Jobber or Write Direct

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2431 SOUTH MICHIGAN AVENUE, CHICAGO 16, ILLINOIS

SPATTER-PROOFING WITH PROTECT-O-METAL CUTS CLEANING TIME 90%

NOT COATED COATED WITH PROTECT-O-METAL

Spatter can't stick to weldments coated with PROTECT-O-METAL. Globules easily brushed or wiped off. No chiseling or grinding to remove spatter. Cleaning done in 10% the time. What's more, PROTECT-O-METAL prevents tight adhesion of slag to bead. Improves the weld by stabilizing arc, assisting fusion, reducing porosity. Nothing in PROTECT-O-METAL to cause gases, fumes, odors. Easily applied with brush or spray. Gallon thinned with water makes 2 or more. Order trial gallon @ $3.00 f.o.b. nearest shipping point. Or ask for proof.

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109 S. SPERLING AVE.
DAYTON 3, OHIO

How to cut Welding Costs ...increase production!

See for yourself! Here's the whole story of the new, versatile P&H welding positioner. Here are the facts you want to know . . . how positioned work saves time, saves costs — based on actual case studies. It's all clearly explained — completely illustrated.

Why put off the savings the new P&H 2500 lb. capacity positioner can give you? Send for your copy of Bulletin WP-2 today! The P&H Model WP-2 Welding Positioner provides more operating advantages than you have ever known in a unit of such low price.

Gen. Off.: 4513 W. National Ave., Milwaukee 14, Wis.

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ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

Canadian *Distribution:* The Canadian Fairbanks-Morse Co., Ltd.

DE-STA-CO CLAMPS

for Simplifying Jigs and Fixtures

If your production operations call for clamping metal, wood or plastic parts during riveting, drilling, welding, gluing, sawing, routing or assembly operations . . . then there is a model of De-Sta-Co Toggle Clamp exactly suited to your needs . . . all are quick acting, lock automatically and hold firmly.

Jigs and fixtures designed to use toggle clamps are made better, for less cost, in shorter time, and will increase production per hour. Send for Bulletin No. 43 which details different types of clamps and illustrates various ways of cutting production time by the use of De-Sta-Co Clamps.

DETROIT STAMPING CO.

Established Over 25 Years

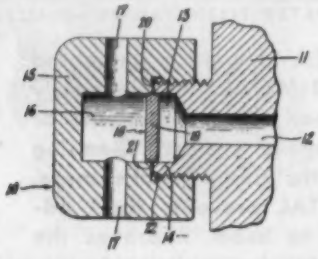
372 Midland Ave., Detroit 3, Michigan

At Right—
Three No. 250 De-Sta-Co Clamps used for holding shell and end caps in location for welding.

FROM THE PATENT OFFICE

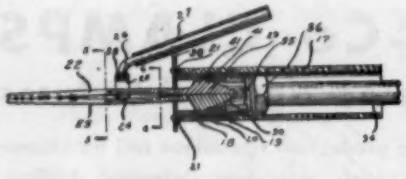
Cylinder Safety Plug

2,353,254. **Edward L. McCandless,** Kenmore, N. Y., assigned to **The Linde Air Products Co.** Filed Oct. 28, 1941. Issued July 11, 1944.



A safety plug or bursting disk for oxygen containers and the like. Disk consists of a round, flat, relatively thick central portion and a relatively thin annular peripheral flange. Flange is positioned in a medial plane between the faces of the central portion and is adapted to be clamped between annular members so that it will shear when the pressure on one side of the disc exceeds that on the other side by a predetermined value. The disk is composed of an alloy consisting substantially of 96% silver and 4% copper.

» «



Electrode Holder

2,353,123. **Philip Bourque,** Detroit, assigned to **Bordon Mfg. Co., Inc.,** Detroit. Filed April 23, 1942. Issued July 11, 1944.

An electrode holder having a tubular retainer and a gripping jaw with a presser head on its butt end. A threaded presser member engages with the head to press it and the retainer into engaged relation with each other.

» «

Weldor's Hood

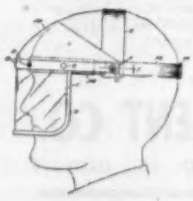
2,352,007. **Roy M. Rickert,** Oakland, Calif. Filed Oct. 9, 1942. Issued June 20, 1944.

A weldor's hood having a sight opening in the front wall and a transparent closure. A hinge connection between the upper horizontal edge of the closure and upper horizontal boundary of the opening allows the closure to swing about a horizontal axis. A yoke is rigidly fixed to one side of the closure and projects laterally from it. The yoke has an elongated slot arranged transversely of the pivotal axis of the closure. There is also a vertically reciprocable member at the exterior side of the yoke. A cam end at the upper end of this member projects through the slot in the yoke and is operative on successive downward strokes of the member to alternately engage opposite sides of the yoke and swing the closure in opposite directions between closed and open positions. A member positioned interiorly of the hood is hinged at one end to the side opposite the vertically reciprocable member and connected at its opposite end through the hood to the lower end of that member. The intermediate portion of the interiorly positioned member may be depressed by the wearer's chin to move the vertically reciprocable member downwardly. A spring constantly tends to move the last-mentioned member to its uppermost position.

» «

Adjustable Eyeshield

2,354,415. **Raymond G. Woodward,** East Orange, N. J., assigned to **Standard Safety Equipment Co.,** Chicago. Filed April 30, 1941. Issued July 25, 1944.



In this adjustable eyeshield harness, a headband of stiff material rests on the top of the head and extends towards the ears. Each end of the headband is slotted to receive a brow-band adapted to encircle the wearer's head. An eyeshield of stiff material is pivotally mounted on the end portions of the headband, and the brow-band is threaded through the headband slots so that the shield and headband may be moved forwardly or rearwardly as a unit.

» «

Crater Eliminator

2,351,083. **Joseph M. Tyrner,** Englewood, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Dec. 6, 1941. Issued June 13, 1944.

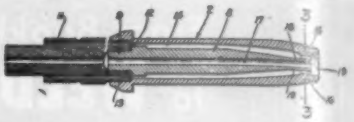
The method of supplying current for arc welding by connecting the work and electrode with a source of current, shunting a portion of the current through a circuit in parallel with the arc circuit and varying the resistance of the arc circuit and the shunt circuit to reduce the current flowing at the arc to a greater extent than would result from the change in the resistance of the shunt circuit alone.

The patent also covers arc-control apparatus for eliminating the crater at the end of a weld bead. This apparatus includes a circuit in series with the arc, a circuit in parallel with the arc.

» «

Torch Tip

2,351,787. **Elmer H. Smith,** Minneapolis, assigned to **Smith Welding Equipment Corp.,** Minneapolis. Filed July 31, 1941. Issued June 20, 1944.

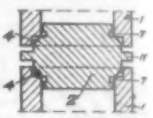


A torch tip comprising an outer tubular member having a restricted bore in one end and an inner member having a reduced cylindrical end portion fitting into the restricted bore. Inner member has a longitudinally disposed cutting-gas passage, and the wall of the restricted bore has a plurality of V-shaped grooves, the wider sides of which are defined by the periphery of the reduced portion of the inner member. The V-shaped grooves are parallel to and encircle the cutting-gas passage and coöperate to provide a plurality of preheating fuel orifices.

» «

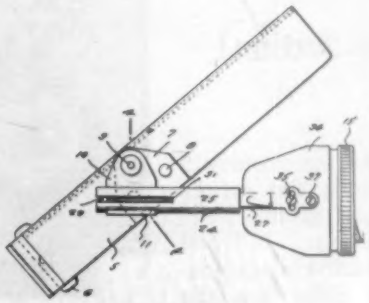
Projection Welding Method

2,352,754. **Bror Anderson,** Saltsjo-Duvnas, and **Hans Wängsjö,** Stockholm, Sweden, assigned to **Aktiebolaget Asea Svetsmaskiner,** Stockholm. Filed May 31, 1941 (in Sweden June 29, 1940). Issued July 4, 1944.



A method of resistance welding for a pair of complementary work pieces, each of which has a pair of surfaces spaced stepwise with a ledge between them. One of the work pieces has a groove adjacent one edge of the ledge for receiving a metal projection connected to the other work piece when the ledges are pressed tightly together during welding. The ledge on one work piece has a beveled groove, and the other ledge is perpendicular to the surfaces, which are substantially parallel.

» «



Welding Goggles

2,353,043. **Edmund Kraski,** Dearborn, Mich., and **Chester Lutowsky,** Detroit. Filed April 21, 1943. Issued July 4, 1944.

Welding goggles having temples pivoted at their rear ends to opposite sides of a headband. A friction means maintains the band and temples in various positions of relative vertical tilting adjustment about the temple pivots. Each temple embodies a spring tension device, including a barrel and a spring-pressed rod slidably telescoped within it. The lens boxes have rearwardly extending eye shields at their outer sides.

FOR WELDING NEEDS

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STAINLESS STEEL ELECTRODES
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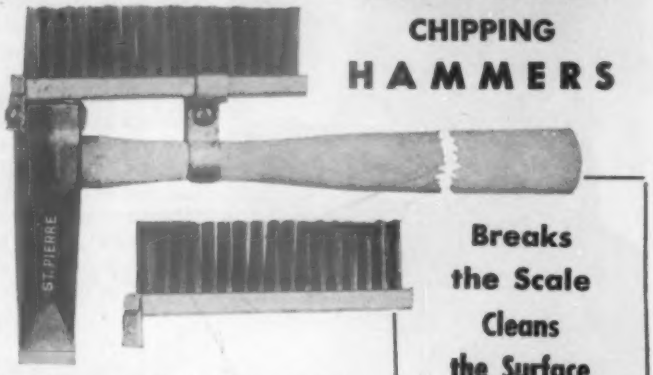

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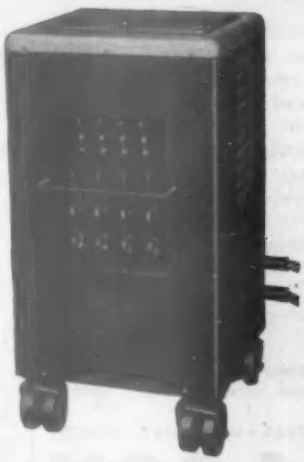

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2 Has flexibility of DC welder, plus the advantages of AC arc.

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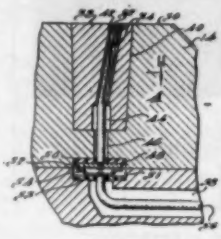
READING PA U.S.A. Established 1870

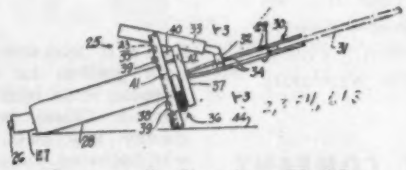
Spot-Welding Electrode

2,354,190. **Louis M. Benkert,** Detroit, assigned to **Progressive Welder Co.,** Detroit. Filed March 21, 1942. Issued July 25, 1944.



A spot-welding electrode having a work-engaging face provided with a bore which receives an insulated wire and a contractable holding member. The latter is so dimensioned that it is contracted when inserted into the bore and thus wedgingly holds the wire with an end exposed upon the electrode face. Pressure exerted between the face and the work serves to conductively couple the end of the wire to an associated means in order to form a thermocouple.

» «

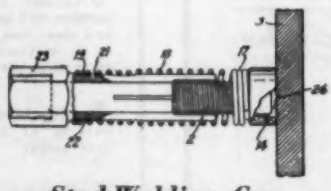


Current-Indicating Holder

2,354,613. **Leo Ralkin,** Jamaica, N. Y. Filed Aug. 7, 1943. Issued July 25, 1944.

An electrode holder designed to indicate the presence of current by means of a lighted lamp. Holder has an electrically conductive clamp portion, a handle and a shield on the handle adjacent to the clamp portion. The shield consists of a pair of spaced plates, at least one of which is made of metal. The lamp socket is located between the plates, which are separated to permit emission of light from the lamp. One terminal of the socket is adapted to establish contact with the metal plate, which is insulated from the clamp portion. The socket also carries a means for establishing a detachable electrical contact between the clamp portion and the second socket terminal. The lamp is protectively housed between the plates and is energized only when the metal plate has been contacted with ground to complete the lamp circuit. Emission of light from the lamp thus indicates the presence of current in the line feeding the clamp portion.

» «



Stud-Welding Gun

2,355,099. **Edward F. Nelson,** San Leandro, Calif. Filed Nov. 12, 1942. Issued Aug. 8, 1944.

In a gun for welding a stud to a plate, a chuck to hold the stud, a ferrule to seat against the plate about the welding end of the stud and a spring interposed between the chuck and the ferrule to press the latter against the plate.

No Soldering • No Rigid Connections • with Punch-Lok

(1) Cut ends square, strip and place sections together. (2) Tension Punch-Lok band around the joint with Loking Tool. (3) Pein corners of lock smooth. (4) Insulate joint with tape or other means. Quickly and easily applied and no normal pull strain can tear it loose.

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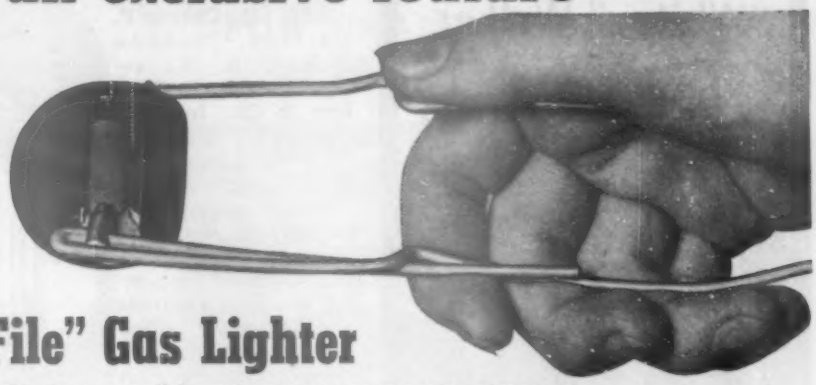

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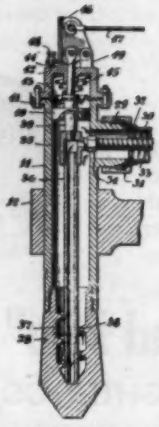
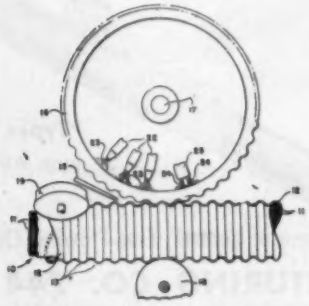


2,355,145. **Chester F. Carlson,** Jackson Heights, N. Y., assigned to **P. R. Mallory & Co., Inc.,** Indianapolis. Filed Dec. 18, 1940. Issued Aug. 8, 1944.

The combination of a pressure-exerting spot-welding electrode and the holder supporting it. Both electrode and holder are hollow and together define a closed chamber. A compressed-refrigerant passage leads into the chamber, and an expanded-refrigerant return passage leads out of it. In the chamber are also a refrigerant expansion valve and a means for controlling it.

» «



Rotary Soldering Iron

2,352,325. **Howard G. Hughey,** Fanwood, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Oct. 3, 1941. Issued June 27, 1944.

Apparatus for soldering the longitudinal seam of a circularly corrugated cable sheath. A rotary soldering iron that turns on a floating axle contacts with the sheath on both sides of the seam; iron has a scalloped peripheral surface that fits into the corrugation of the surface of the sheath. A roller holds the sheath against the iron.

In this method of soldering, the periphery of the soldering iron is rolled along the work piece in the direction in which the longitudinal seam extends. One or more heating flames are applied just before the iron contacts with the work piece, and the solder adjacent the iron is hardened by a jet of cooling fluid directed behind the heated region.

» «

Hard-Facing Alloy

2,355,271. **Arthur T. Cape,** Santa Cruz, Calif., assigned to **Coast Metals, Inc.,** Canton, O. Filed Aug. 26, 1942. Issued Aug. 8, 1944.

A ferrous alloy and weld rod particularly adapted for hard-facing purposes. The alloy contains carbon in amounts of from about 1 to 4.5%, chromium from 20 to 30%, molybdenum from 7 to 20%, more than 13% and up to 17% nickel and 10 to 30% cobalt. The remainder is substantially all iron.

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Permits quick detach of holder from cable, no time wasted.

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For universal work taking smallest electrodes up to 5/16 in. inclusive.

★BALANCED—LIGHT WEIGHT—STREAMLINED
For greater efficiency, more work, less fatigue.

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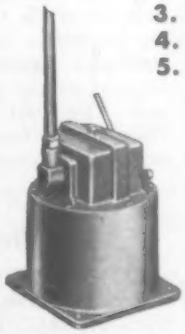

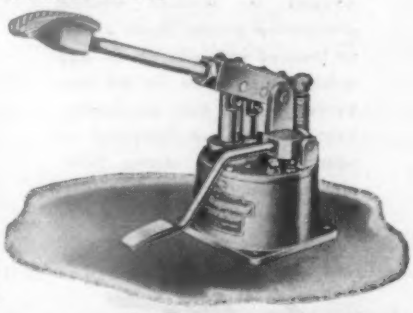

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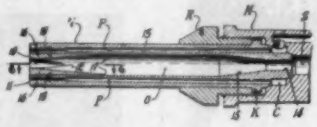
Sellstrom

MANUFACTURING CO.

662-9 N. Aberdeen St. Chicago 22, Ill.

Flame-Descaling Tip

2,353,318. **Arthur P. Scheller,** Irvington, N. J., assigned to **The Linde Air Products Co.** Filed March 8, 1940. Issued July 11, 1944.



A torch nozzle with an axial oxygen passage having a laterally wide discharge orifice and an intermediate portion of slightly larger cross-sectional area than the discharge orifice. The upper and lower walls of the oxygen passage gradually converge from the intermediate portion to the discharge orifice, while the lateral side walls diverge from the width of the intermediate portion to the discharge orifice. The degree of divergence of the side walls is such that the cross-sectional area of the discharge orifice is substantially equal to the cross-sectional area of the passage at the transverse plane where the divergence of the side walls begins.

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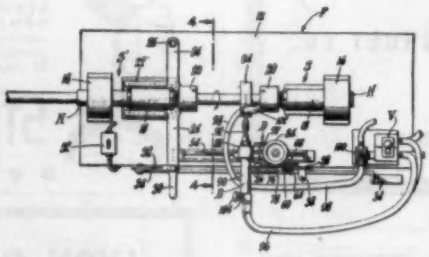

Automatic Gas Welding

2,354,267. **Arthur R. Lytle** and **William Morton,** Niagara Falls, N. Y., assigned to **The Linde Air Products Co.** Filed March 22, 1941. Issued July 25, 1944.

A process for welding metal members with congruent circular end surfaces. The members are arranged with these surfaces in axial alignment and in adjacent relation. Torch heat is then applied to each surface in order to fuse it and form a film of molten metal. Each of the members is rotated in synchronism at substantially uniform angular velocity while the end surfaces are being heated in order to maintain a substantially uniform distribution of the films of molten metal and minimize metal loss. The heated end surfaces are thereafter moved together under pressure to complete the weld.

» «

Head Shield

2,354,502. **William T. Cockrill** and **Thomas J. Duncan,** Flint, Mich. Filed April 21, 1943. Issued July 25, 1944.

A head shield with a hood having an opening in the front over which an inner protector is hingedly suspended. On the inner protector there is hingedly mounted an outer protector, which includes a plate having an opening and filter glasses mounted on the plate over the opening therein.

"Jorgensen" CLAMPS

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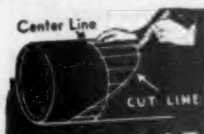

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